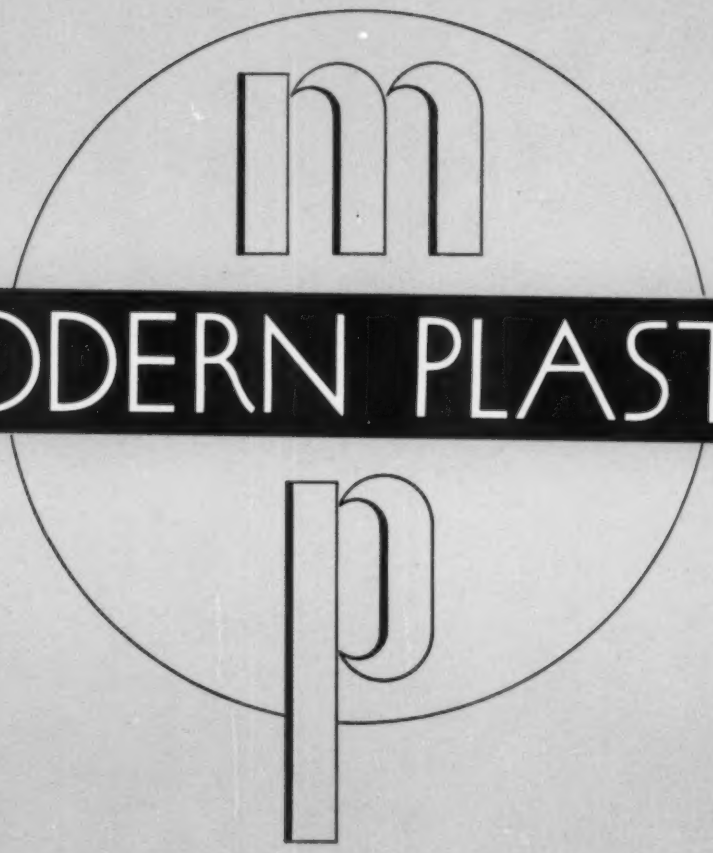


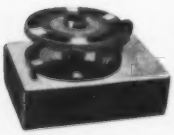
MODERN PLASTICS

MAY 1953

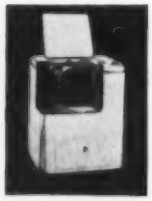
Good for your home...

FREEDOM IN DESIGN

RESISTANCE TO SHOCK

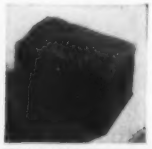


DIMENSIONAL STABILITY



ACID & ALKALI RESISTANCE

Good for your business ...DUREZ PHENOLICS



HEAT & COLD RESISTANCE

Member S. P. I. Committee on Large Plastics Moldings.

● A look around a good up-to-date home will give you a lot of information about materials you could use in your own business.

Take the phenolics . . . the molding plastics and the resins we have developed at Durez. They usually pay their way by *working* under conditions of service requiring remarkable combinations of properties.

Lustrous molded-in surface plus non-conductivity plus moldability in large TV cabinets, for instance. Non-snagging smoothness plus alkali resistance in washing machine impellers. Temperature and moisture resistance in resin-bonded insulating batts. And many more.

With good reasons the phenolics are known as the most versatile of the plastics in hard-service applications. We'd like to work with you in investigating their use in what *you* make. Let us check your requirements with your molder, whether they be better appearance, better performance, lower production cost . . . or all three.

DUREZ

PHENOLIC RESINS

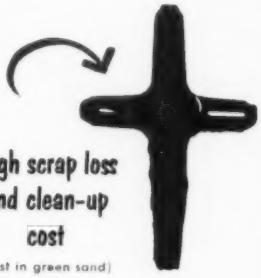
- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

Our monthly "Durez Plastics News" will keep you informed on industry's uses of Durez. Write, on office letterhead.

DUREZ PLASTICS & CHEMICALS, INC.
1205 Walck Road, North Tonawanda, N. Y.

PHENOLIC PLASTICS THAT FIT THE JOB

Keeping up on PHENOLIC RESINS



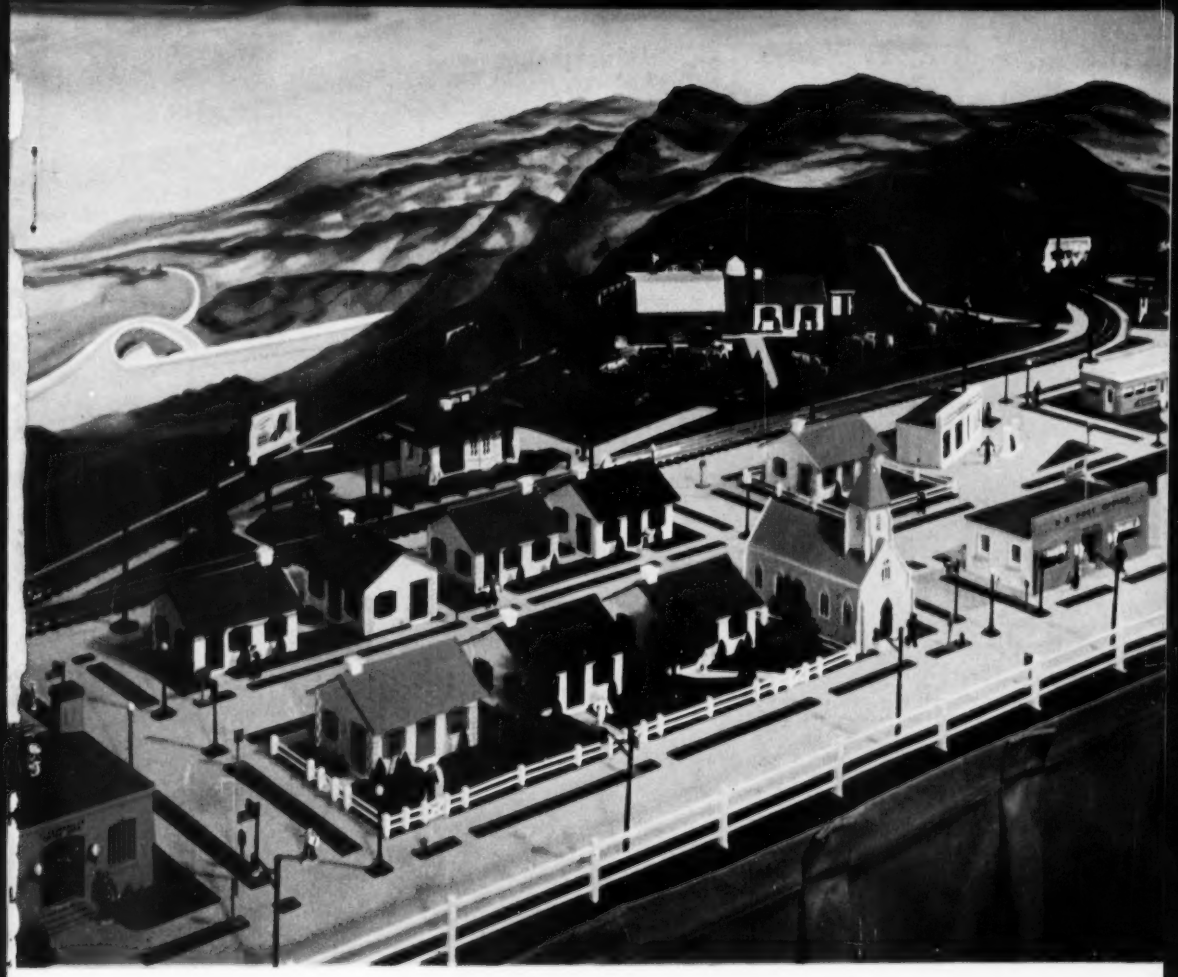
High scrap loss and clean-up cost
(cast in green sand)

Shell molding success with MAGNESIUM

Clean-up down, no scrap loss
(cast in shell molds)

Here's another field where Durez phenolic resins are playing a part in industrial progress. Using shell molds of sand and resin instead of the familiar green sand method, foundrymen now turn out smoother, more accurate castings in a variety of metals. Perhaps *your* business is facing a problem that resins can help in solving. As specialists in phenolics, Durez is ready to work with you.

count on DUREZ for PHENOLIC RESINS too



Catalin Styrene salutes

a boom town in miniature—"PLASTICVILLE, U. S. A."

Into the excitingly full lives of hobbyists, model railroad builders—and youngsters, too—comes *The Town that Grows and Grows* . . . Plasticville, U.S.A.! A spectacularly ingenious testimonial to molded plastics know-how and a tribute to the wisdom of "the town fathers" for having chosen CATALIN STYRENE as their construction material.

"Plasticville, U.S.A. is an inviting town! You can live in a Cottage, Ranch Home or Farm House. You are sure to meet nice People on its Avenues. You can gas-up at the local Filling Station . . . enjoy a snack at the Diner . . . shop Main Street's choice selection of smart Stores . . . step into the Post Office . . . pass the time at the Fire House . . . marvel at the Utility Accessories . . . and worship at the little Church around the corner—but—don't park in front of a Hydrant . . . otherwise you'll be summoned to Plasticville's Police Station."

Designed realistically and scaled to both 1/4" and 1/8" to the foot, every structure is a thrill to assemble and set on location. Each colorful, lightweight and sturdy CATALIN STYRENE section fits like a glove—is dimensionally stable—won't warp, sag or settle . . . which is more than can be said about some of today's "full size" building projects.

A resounding salute, therefor, is in order from CATALIN STYRENE to Plasticville, U.S.A.'s founders, Bachmann Bros., Inc., Philadelphia, Pa.—who, in themselves, were founded in the early days of 1833!

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

CATALIN

In addition to Styrene Molding Compounds, Catalin chemical products include a wide range of Urea, Phenolic, Cresylic, Resorcinol, Melamine and Styrene Resin formulations.

MODERN PLASTICS*

MAY 1953 VOL. 30, NO. 9

CONTENTS

Modern Plastics, published monthly by Breskin Publications, Inc., at Emmett St., Bristol, Conn. Executive and Editorial Office: 575 Madison Ave., New York 22, N. Y. Entered as second class matter at the Post Office at Bristol, Conn., December 14, 1950, under the Act of March 3, 1879. Subscription $6.00 a year, $11.00 for two years, $15.00 for three years in the U.S., its possessions, South America, and Canada. All other countries $12.00 a year, $20.00 for two years, $28.00 for three years, payable in U.S. currency. Price of this issue 75 cents per copy in the U. S., its possessions, South America, and Canada; all other countries $1.25. Printed in the U.S.A. by the Hildreth Press, Inc., Bristol, Conn.

*Reg. U.S. Pat. Office

Another new development using

B. F. Goodrich Chemical *raw materials*

B. F. Goodrich Chemical Co. does not make this plastic pipe. We supply the Geon resin only.

THIS rigid polyvinyl plastic pipe is doing a beautiful job of carrying highly corrosive, acidified dilute brine, where other types of hose or pipe caused difficult problems.

For example, when rubber hose was used, it plugged up because the rubber particles carried in the brine tended to stick to the side of the hose. This meant dismantling and unplugging the hose about every three months.

With metal pipe, the rubber particles would stick to the welding. And another type of corrosion-resistant pipe was hard to install and broke easily.

This rigid plastic pipe, made with Geon polyvinyl chloride resin, takes care of all those problems and more! Pipe like this can be made rigid *or* flexible, useful for underground or overhead piping to carry liquids or gases.

It resists soil acids or alkalies and electrolysis. No protective coating or wrapping is needed. It can be made light enough for a small boy to lift easily. Polyvinyl plastic pipe is four to six times lighter than steel pipe of equal length, diameter and wall thickness.

To the economies in use and maintenance, add the savings in racking, stringing, handling, freight and shipping costs with plastic pipe like this!

It's another example of how Geon materials help improve or develop products, and lower costs. Perhaps they can help you. For technical information, write Dept. GB-5, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors

here are some of the reasons why

60%

of our business comes from firms whom we have served

15 *years or more*

These folks know that, at Chicago Molded, they are getting the benefit of 34 years experience in plastics . . . the know-how that pioneered many of today's most widely used and successful applications.

They have learned that no matter what their molded plastics application may be . . . no matter what the size of the piece or how great the quantity . . . whether it calls for thermosets, thermoplastics or both . . . they need only this one source of supply to handle the entire job.

They realize the importance of fine mold design and construction and know that Chicago Molded has a national reputation for tools of extreme precision and highest production efficiency.

They have experienced the advantages of working with some of the best qualified designers and engineers in the industry . . . many with 20 to 30 years experience with this organization.

They have found here a unique faculty for understanding their needs and interpreting them promptly; the seasoned judgment to avoid costly misapplications; the competence which is so essential to a sound molder relationship.

It's easy to see why, with all these advantages available, hundreds of the leaders of industry come to Chicago Molded year after year for the best in molded plastics. These same advantages are available to you . . . now . . . anytime. That's why you'll find it good business to discuss plans with a Chicago Molded Engineer. Just write, wire or phone. There's no obligation.

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PRODUCTS CORPORATION

CUSTOM MOLDERS OF ALL *Plastics*

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Executive and Editorial Offices
575 Madison Ave., New York 22, N. Y.
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Branch Offices
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J. M. Connors Tel., Delaware 7-0060
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EDITORIAL

Junior Achievement in Plastics

At this time every year the Junior Achievement companies from coast to coast close out their businesses. The more successful ones pay off their shareholders with a little dividend; the less successful simply call it quits and pay off their creditors.

Right now slightly over 1500 of these miniature companies operated by teen-agers over the past several months are going through this process. Of these, 174 are plastics enterprises, an increase of 10 over the 1952 level.

It is no wonder that 12% of these little companies went in for plastics. Plastics are exciting to youth, interesting to work with, and offer opportunities for ingenuity and aggressive policy.

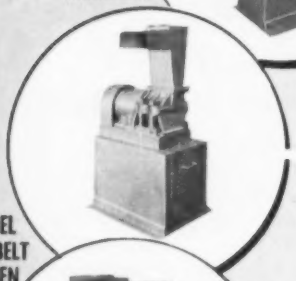
What is a wonder—and a sad wonder—is that of these 174 Junior Achievement plastics companies, only 29 were sponsored by senior plastics companies. Eleven were sponsored by different material makers; 18 were sponsored by processors, fabricators, and molders. An article in this issue by the president of Junior Achievement, Inc., tells the story. It is a story of opportunity being missed by individual managements of companies in the plastics industry. Here's why:

First, the plastics industry has a bigger job to do than most, in acquainting the rising generations with its materials and their properties. And how better can a youngster get acquainted with plastics than by working with them under the direction of a sponsoring company in the plastics business? Second, the type of teen-ager who is attracted to Junior Achievement is the very type of self-starting enterpriser that built the plastics industry and that will build it in the future. Third, the effect of the good opinion of the older child today on the buying habits of the nation is incalculable. The word-of-mouth advertising given to plastics by the kids can be a big factor for immediate sales. Fourth, Junior Achievement companies are what editors call "publigenic" and a plastics company sponsoring a Junior Achievement company will gain publicity advantage therefrom.

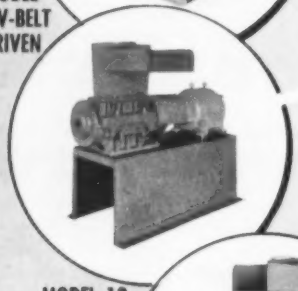
While it is very fine that in the fiscal year just closed there were 174 Junior Achievement plastics companies, it is regrettable that most of them were sponsored by railroads, insurance companies, banks, automobile manufacturers, and heavy machinery makers rather than by companies engaged every day in plastics manufacturing, processing, and molding.

This project is a part of our educational activity as an industry and a part of our public-relations activity. It is a most important part of both these activities. What we would like to see in the fiscal year that will end in May 1954, is three hundred Junior Achievement plastics companies, at least half of them sponsored by plastics companies.

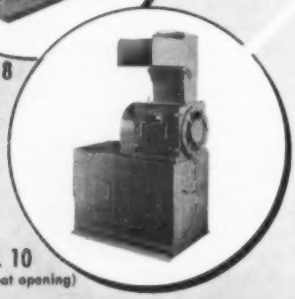
MODEL ½



MODEL ½ V-BELT DRIVEN



MODEL 18



MODEL 10
(6" x 10" throat opening)

There's a CUMBERLAND GRANULATOR that's *RIGHT FOR YOU!*

YOU'LL GRANULATE MORE ECONOMICALLY WITH A CUMBERLAND MACHINE THAT'S BUILT-FOR-THE-JOB.

Each granulating job in your plant has its own specific problems. Only a granulator that's built-for-the-job can do the job most efficiently.

Whether you granulate combs or television cabinets, brittle or elastomeric materials, there's a Cumberland granulator designed to meet your needs. Each machine is easy to operate, easy to clean, and extremely rugged.

We'll be glad to help you analyze your needs and recommend the granulator that's exactly right for you!

For more information, write for Bulletin 251.

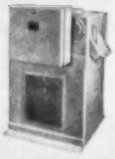
OTHER CUMBERLAND MACHINES

NEW PREBREAKER

Cuts up radio, television cabinets and other large parts. Two machines available: Model 32 (20" x 32" throat opening); Model 24 (10" x 24" throat opening). Write for details.

ROTARY CHOPPING MACHINE

Heavy duty, rugged machine. Used for cutting thick vinylite slabs from two roll mills. Also used as large capacity pelletizer. Other applications are described in Bulletin 400.



PELLETIZING MACHINE

Smaller, companion model to Rotary Chopper. Designed specifically for use with continuous extruders. Gives efficient, trouble-free performance. Write for complete details.

CUMBERLAND *Engineering Company Inc.*

BUILDERS OF BETTER MACHINES FOR THE PLASTICS INDUSTRY

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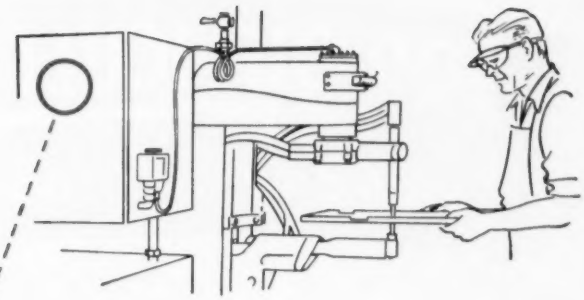
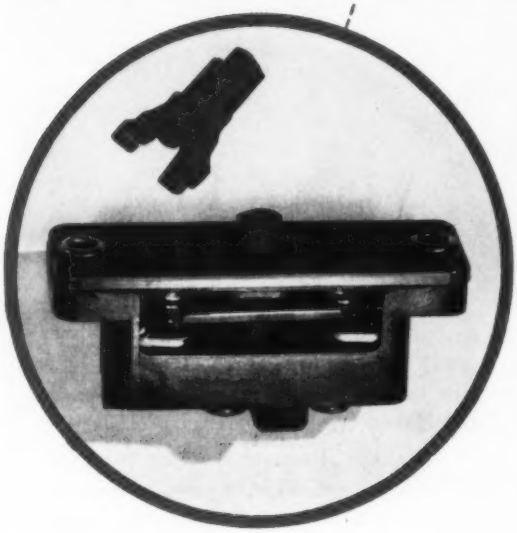


Improved switch performance with Du Pont nylon plastic



Button molded by
Gries Reproducer Corp,, New York, N. Y.
for
Square D Company, Milwaukee, Wisc.

DU PONT
REG. U.S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY
Polychemicals
DEPARTMENT
PLASTICS • CHEMICALS

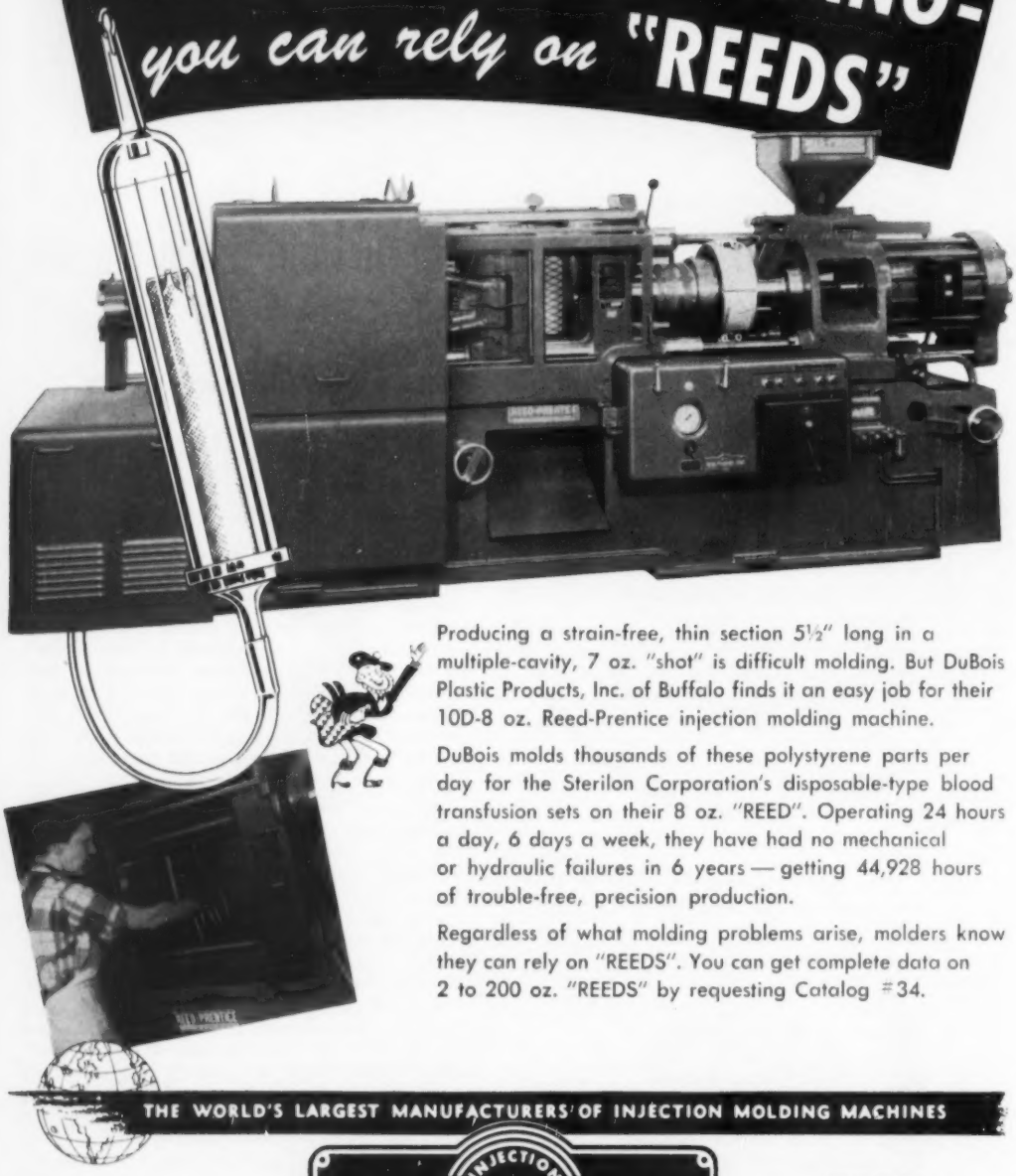
Molded part increases electrical clearance and service life of snap switch . . . cuts costs

Precision snap switches are used as limit controls in small machine tools and as basic contact mechanisms in industrial instruments. In timing relays on resistance welding machines, for example, they control the duration of current flow and electrode motion. Two key parts affecting the switch's performance are the operating button and stem. They require accurate dimensions that must stand up under severe wear.

For their switches, the Square D Company specified that the button and stem be molded in one piece from Du Pont nylon plastic. Tough, resilient Du Pont nylon resists abrasion. Critical dimensions are maintained. Nylon can be molded to close tolerances for finer dimension control and improved operation. The superior insulating properties of nylon increase electrical clearances . . . permit extended Underwriters' Laboratories listing. According to Square D Company: "The nylon part gives more accurate trip characteristics, longer service life and increased electrical clearance." Nylon's light weight and strength in thin sections mean mass production by rapid injection molding at low cost per unit. This nylon part costs 60% less than the former two-piece assembly.

This is another example of where Du Pont nylon plastic serves industry as a superior engineering material. Perhaps it can be of value to you. For full information on nylon and other Du Pont plastics, write: E. I. du Pont de Nemours & Co., (Inc.), Polychemicals Department, Room 305, Du Pont Bldg., Wilmington 98, Delaware.

FOR DIFFICULT MOLDING- *you can rely on* "REEDS"



Producing a strain-free, thin section 5½" long in a multiple-cavity, 7 oz. "shot" is difficult molding. But DuBois Plastic Products, Inc. of Buffalo finds it an easy job for their 10D-8 oz. Reed-Prentice injection molding machine.

DuBois molds thousands of these polystyrene parts per day for the Sterilon Corporation's disposable-type blood transfusion sets on their 8 oz. "REED". Operating 24 hours a day, 6 days a week, they have had no mechanical or hydraulic failures in 6 years — getting 44,928 hours of trouble-free, precision production.

Regardless of what molding problems arise, molders know they can rely on "REEDS". You can get complete data on 2 to 200 oz. "REEDS" by requesting Catalog #34.

THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

INJECTION
REED-PRENTICE CORP.
WORCESTER MACHINES MASS., U.S.A.

REPRESENTATIVES:
Houston ..... Preston Machine Tool Sales Co.
Seattle & Spokane ..... Star Machinery Co.
Minneapolis ..... Chas. W. Stone Co.
Los Angeles ..... Western Molders Supply Co.

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BRANCH OFFICES
75 West St., New York 6, N. Y.
1213 West 3rd St., Cleveland 13, Ohio
4001 N. Elston Ave., Chicago 18, Illinois
2842 W. Grand Blvd., Detroit 2, Michigan

Case molded by Pan American Plastics, Dallas, Texas, from Celanese® acetate.

An Acetate plastic case tough enough to handle 8 times its weight in steel

When the manufacturer of Sears' "Craftsman" Cutter Head needed a lightweight plastic case—

tough enough to resist shattering . . .
moldable with sections and cores to keep contents from shifting . . .
with chip-proof surface permanence . . .
eye-appealing colors . . .

it was a hard-to-beat combination of specifications that acetate met and delivered.

Acetate provides strength in thin cross sections . . . one-piece, weight-saving construction . . . molding ease and efficiency . . . and real economy. It is the *right* plastic when cases and housings must be tough.

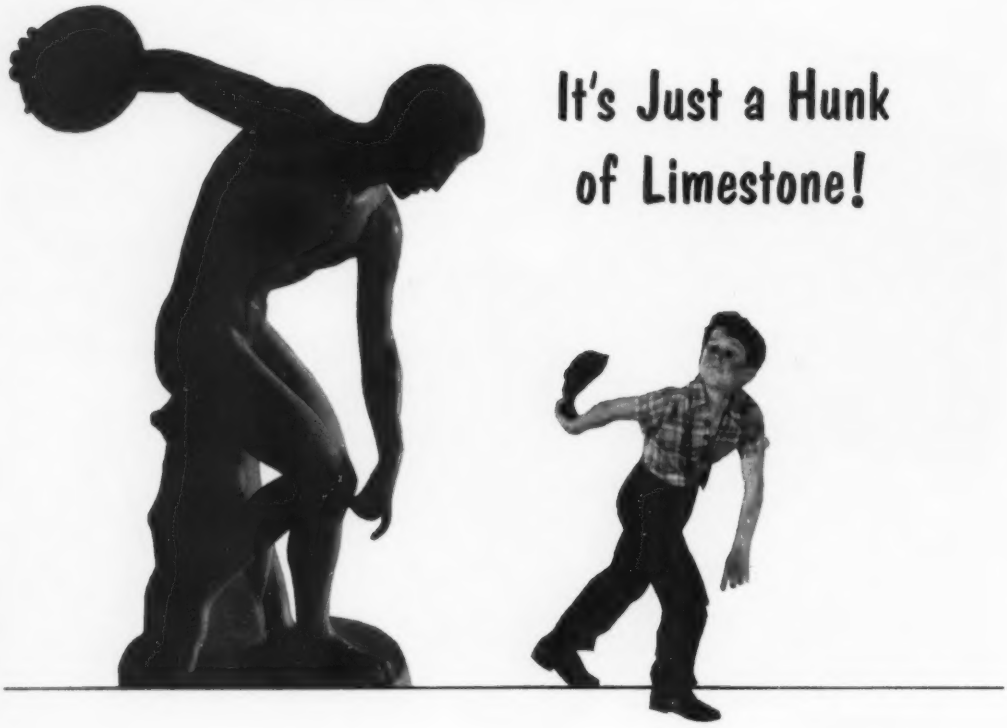
Celanese Corporation of America, Plastics Division, Dept. 101-E, 290 Ferry Street, Newark 5, New Jersey.

Canadian affiliate, Canadian Chemical & Cellulose Company, Ltd., Montreal and Toronto.

Celanese®

ACETATE
TOUGH
PLASTICS

*Reg. U. S. Pat. Off.



It's Just a Hunk of Limestone!

Scientifically, the Discus Thrower is just impure limestone—a piece of calcium carbonate—plus creative thinking. The creative thinking gave it value. Actually far better quality calcium carbonate is precipitated by DIAMOND. It is processed in several forms so that, with your creative thinking, you can give plastics the durability and other characteristics they need to compete with metal.

You can use DIAMOND $CaCO_3$ to achieve smoother surfaces, eliminate cracks and the evidence of glass fibres in catalyzed, glass-reinforced polyester resins. You can also improve the wet strength of the polyester resin, reduce shrinkage and LOWER MATERIAL COST.

DIAMOND'S Technical staff has recently added several plastics experts to its already extensive man power and has installed the latest laboratory equipment for working with plastics. Let us help you achieve more salable products. We believe your market is still hardly tapped. Write for literature or submit your detailed inquiry.

DIAMOND SALES OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Houston.

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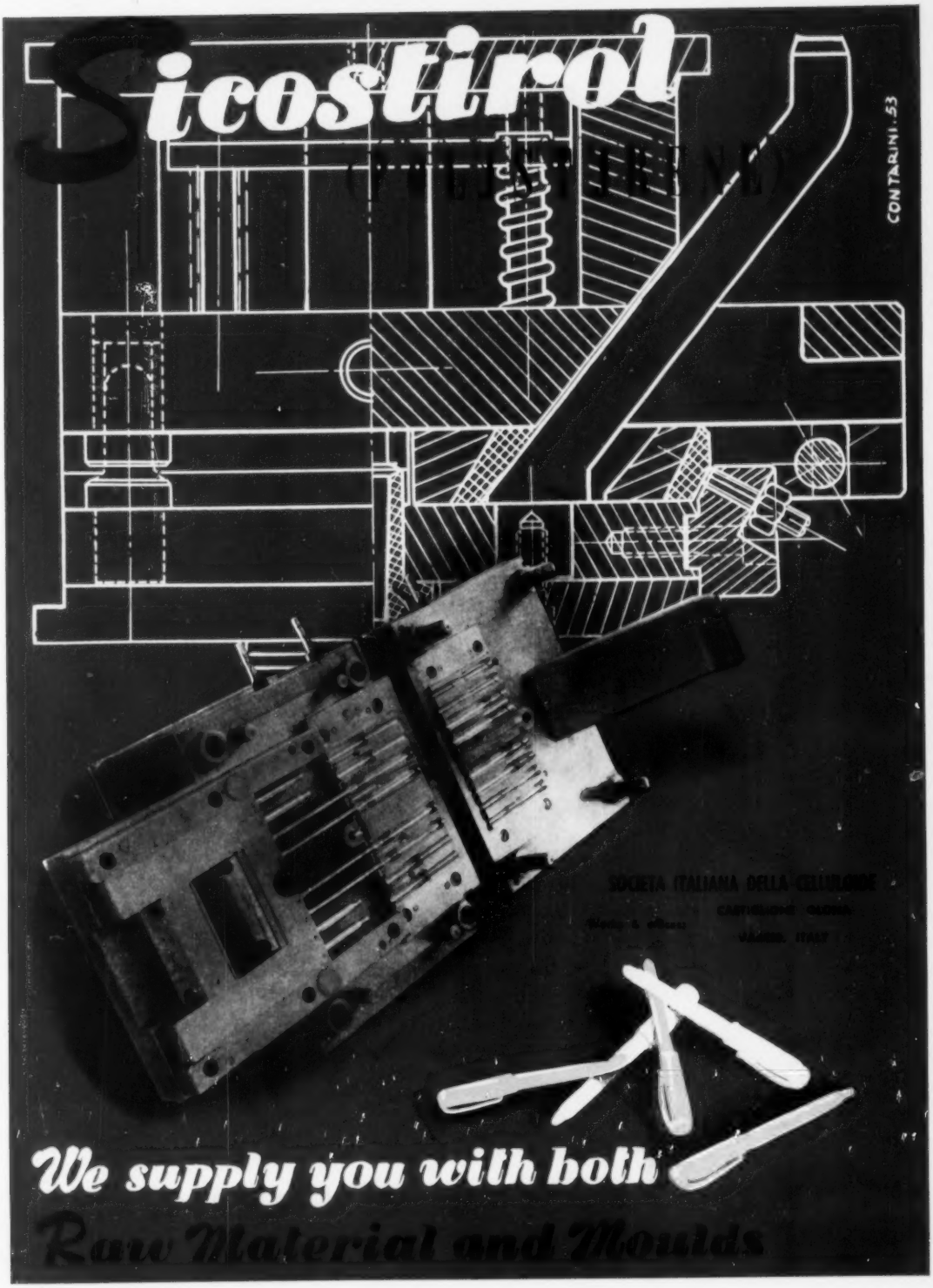
DIAMOND CHEMICALS FOR PLASTICS COMPOUNDING

DIAMOND ALKALI COMPANY • CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS ®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CONTARINI 53
SOCIETA ITALIANA DELLA CELLULOIDE
We supply you with both
Raw Material and Moulds

Bargain Day

Let's face facts: a genuine bargain is hard to come by; people don't go around giving things away at cost . . . or even less.

Whether you're new or old at this business of buying custom molding, it's a good policy to deal with a responsible, established molder. Pay the price (it will probably be sober and within reason) and spare the aspirin later. Even a carload of aspirin, we've heard from people who know, won't conjure up a single usable molding when a corner-cutting smart Alec lets you down.

Let's face facts: leave the bargain hunting to the Mrs. For good injection moldings, come to a guy who asks a fair price and delivers a good product. . . . Like us.

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

NEW YORK OFFICE — CHANIN BUILDING, 122 EAST 42ND STREET, MURRAY HILL 6-8540

an MPM extruder puts you in business

even if you have no experience

AN mpm EXCLUSIVE

The price of your machine includes instructions on operating it to produce a wide range of products

FILM	COVERED WIRE
GARDEN HOSE	TUBING
COATED PAPER	MONOFILAMENTS
TOOL HANDLE RODS	

Which extrudable product do you want to make? Whatever it may be, Modern Plastic Machinery Corp. supplies the proper equipment and instructs you in its operation. We also design and supply dies to your requirements.

Many MPM installations include every auxiliary unit needed for producing a given product. Yet, because the extrusion process is so very flexible, owners of MPM extruders often make additional profitable products merely by varying the relatively inexpensive dies.

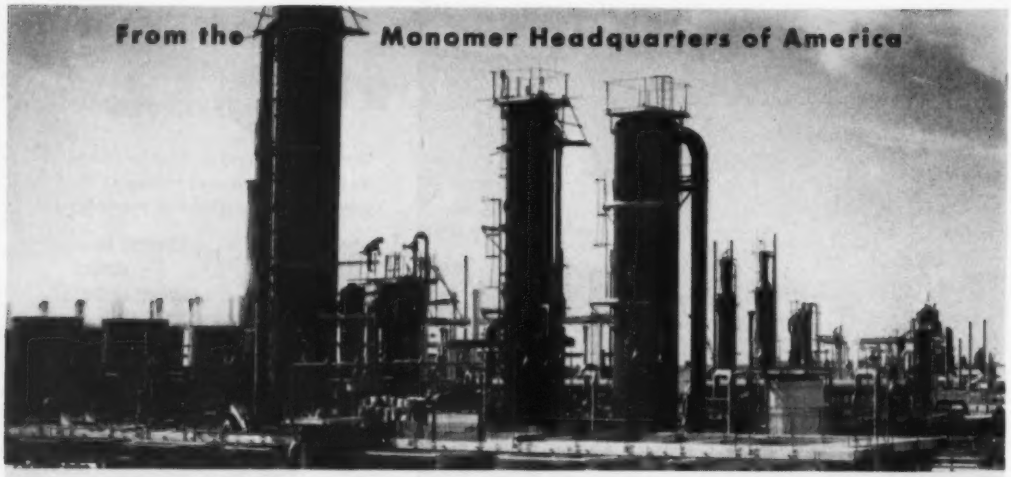
We can give you the same guidance and assistance we have given others. Successful operations all over the world demonstrate our ability to start you in the extrusion business.

Write today telling us what you want to extrude. MPM has several interesting "packaged units" for making film, sheeting and other products. Remember, when you buy from MPM, you're buying not only an extruder, but a business.

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
4113 W. Jefferson Blvd., Los Angeles 16, Cal.

modern plastic machinery corp.

15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX



STYRENE
ACRYLONITRILE
VINYL CHLORIDE

Interested in new, profit-making copolymer resins? Like to up-grade your present products or develop new paths for organic syntheses?

The "big three" in monomers . . . Monsanto's STYRENE, ACRYLONITRILE, VINYL CHLORIDE . . . are your answer. They are among the most versatile organic compounds yet developed. They have many potential new uses.

Example: Bisphenol cyanoethylated with two mols of ACRYLONITRILE yields a dicyanoethylated material. This product may be hydrolyzed to a dibasic acid or reduced to the corresponding diamine. Condensation of the dibasic acid with the diamine results in a high molecular weight polyamide suitable for fibers. The properties of this type fiber can be varied widely by using other diphenols as starting materials.

To get the top-quality monomer you need for your exploration of this fast-moving new field, specify Monsanto:

TOP QUALITY . . . all monomers are highest purity, produced with strict control in the most modern plant.

SWIFT DELIVERY . . . by tank car, tank truck and drum from five strategically located shipping points.

TECHNICAL SERVICE . . . on storing, handling and inhibiting.

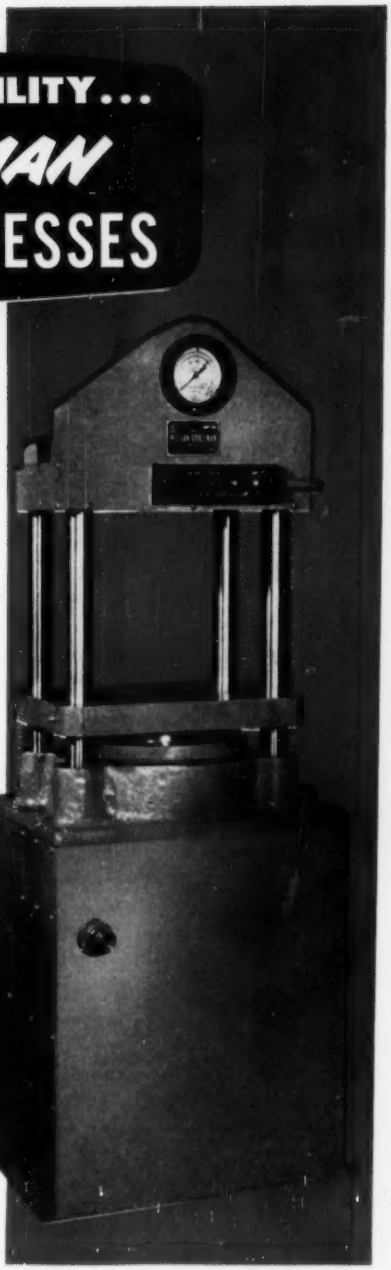
For full information on THE REACTIONS OF MONOMERIC STYRENES, request a copy of Monsanto's study of several hundred reactions. Address request on your company letterhead giving full information so that a Monsanto representative can deliver the book to you personally. Write MONSANTO CHEMICAL COMPANY, *Texas Division, Texas City, Texas.*

MONSANTO
CHEMICALS—PLASTICS

Serving Industry . . . Which Serves Mankind

FOR ALL-AROUND VERSATILITY...

WATSON-STILLMAN GENERAL PURPOSE PRESSES



For anything including production runs – in plastics molding, laminating, metal forming, bending, straightening, light hobbing and forcing – these W-S General Purpose Presses can't be beat. Their controls and precision workmanship make them ideal laboratory and production equipment of wide application.

If you're taking a licking on short-runs with single-purpose machines, re-appraise your overall operation in terms of these presses-of-all-work. Economical, easy to set-up and maintain . . . they add up to more profits and uniform production. Capacities: 30, 50, 100, 200 tons.

AVAILABLE FROM STOCK FOR IMMEDIATE DELIVERY

Write today for Bulletin Sheet 370-D

W-S HYDRAULIC
ESTABLISHED 1848

THE WATSON-STILLMAN COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

150 ALDENE RD., ROSELLE, NEW JERSEY

9-0-66

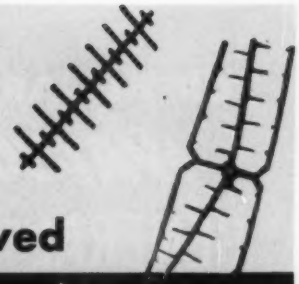
W-S "Completeline" Hydraulics ... The Shortest Distance From Production to Profits

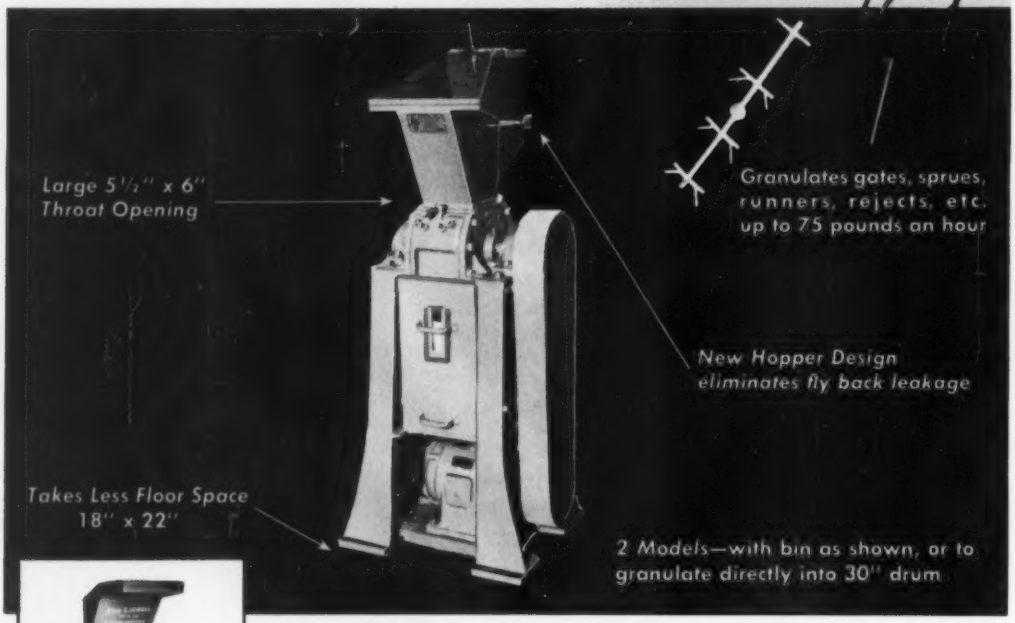
Great News!

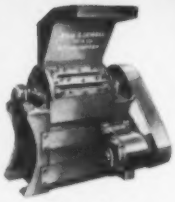
NEW MIDGET GRANULATOR

FOR BESIDE-THE-PRESS GRINDING

Now Redesigned and Improved

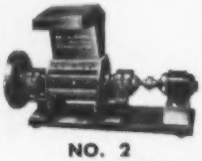






NO. ½

Medium size machine. Capacity up to 500 lbs. per hour. 7½ or 10 H.P. motor.



NO. 2

For heavy-duty grinding. Capacity up to 1800 lbs. per hour. 40, 50 or 60 H.P. motor.

Has Molder-Recommended Features...

Comparison proves the new B&J Midget Granulator offers more advantages, feature for feature. This new design was dictated by many molders throughout the country to answer every requirement.

The new B&J Midget takes the absolute minimum of floor space—18" x 22" — an important essential with space at a premium.

The large size throat will easily handle gates, sprues, runners, etc., from ⅛" to ½" sectional thickness.

All parts of the Midget are easily accessible—hopper, screen, and chute or bin are quickly removed for cleaning. Standard screen furnished to meet your granule size requirements. Available with or without casters for portability. And, the B&J Midget is sturdily built for long, trouble-free operation.

There's a B&J grinder for every need. Tell us your requirements or send samples of your material for grinding in our testing laboratory. Also write for brochure describing the complete B&J line.

REMEMBER! B&J GRINDERS ARE BUILT TO LAST LONGER!

BALL & JEWELL, INC.

22 FRANKLIN STREET BROOKLYN 22, NEW YORK

Hold your answer! We've got three more questions. Can your part be moulded by thermosetting methods? Can it be moulded with standard thermosetting materials or newer materials like Teflon, Alkyd or glass-reinforced plastics? Do you need quick deliveries in production quantities? Three "yes" answers, and your part problem's solved. We're custom moulders for *any* thermosetting job—with complete moulding facilities, including design and mould making. Phone or write *your* questions to Dayton or your local branch office.

Kurz-Kasch, Inc. • 1415 S. Broadway • Dayton 1, Ohio

BRANCH SALES OFFICES: New York, Lexington 2-6677 • Rochester, Hillside 4352 • Chicago, Merrimac 7-1830 • Detroit, Trinity 3-7050 • Philadelphia, Hilltop 6-6472 • Dallas, Logan 1970 • Los Angeles, Richmond 7-5384 • St. Louis, Delmar 9577 • Toronto, Elgin 4167
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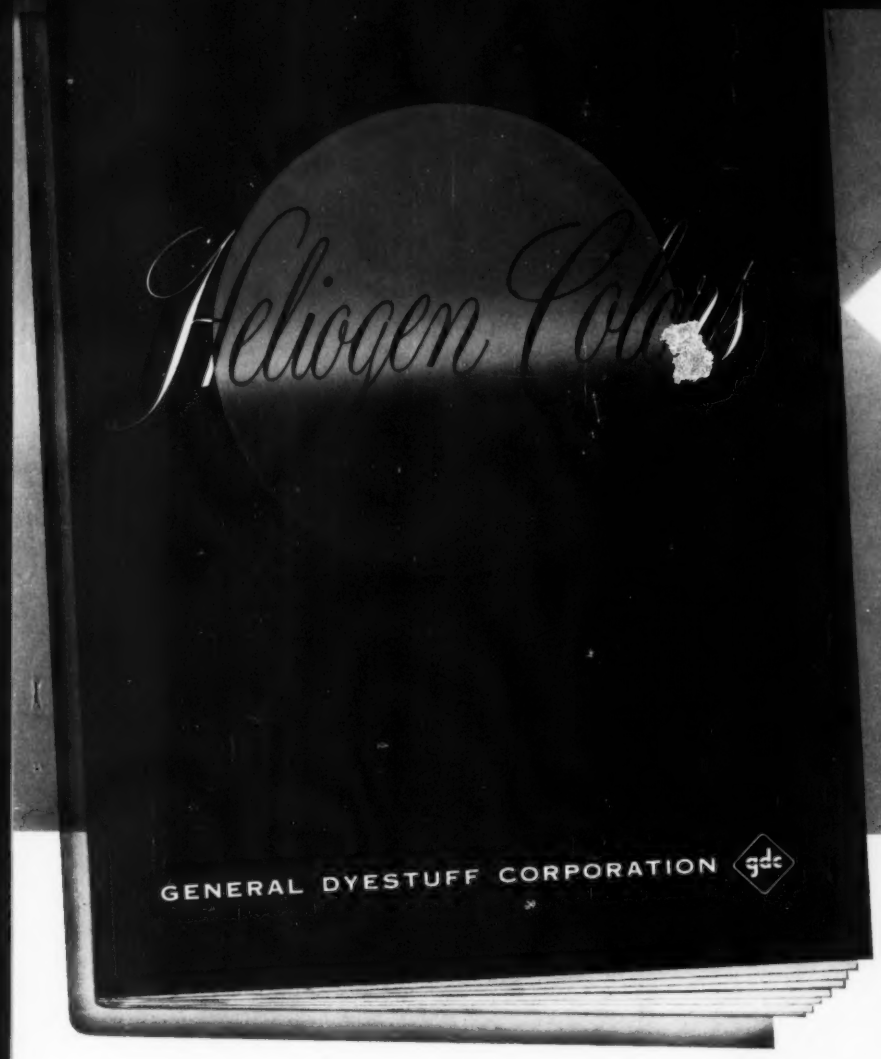
Kurz-Kasch

FOR OVER 36 YEARS PLANNERS AND MOULDERS IN PLASTICS



for outstanding permanence in blues and greens

When permanence is a primary requirement in blues or greens, the answer for years has been

HELIOGEN colors, pioneer phthalocyanine compounds.

Outstanding for:

- ENAMELS
- FLUSHING IN OILS
- LAKES
- PAINTS AND LACQUERS
- PAPER
- PLASTICS
- PRINTING INKS
- ROOFING GRANULES
- RUBBER
- SOAP
- TEXTILE PRINTING

For more complete information send for the HELIOGEN brochure describing the products as to shade, physical state and working properties.

gdc

GENERAL DYESTUFF CORPORATION

435 HUDSON STREET • NEW YORK 14, NEW YORK

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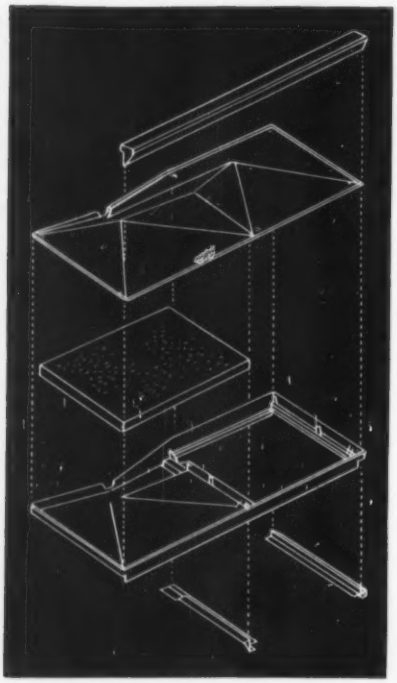
PARTNERS IN PERFECTION!

Bridgeport helps team plastic with metal to make a superior refrigerator by—



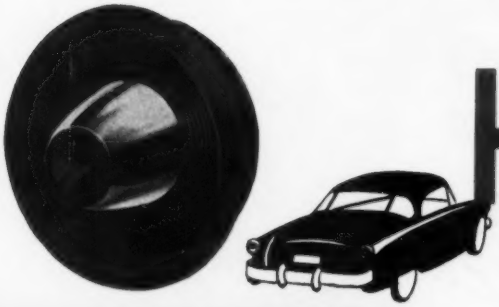
Westinghouse

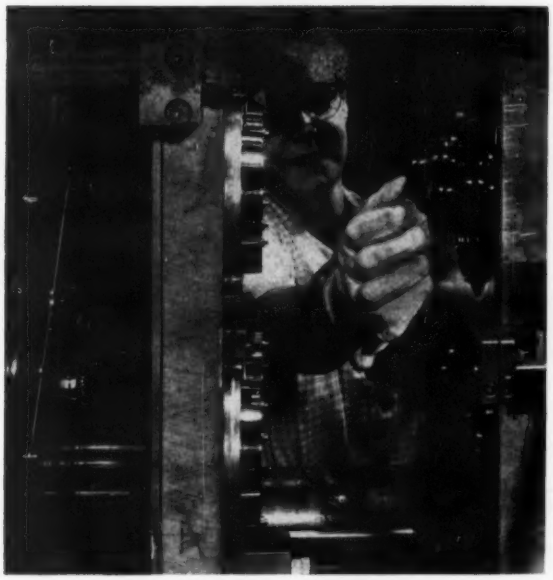
To give customers the advantages of plastic *plus* the benefits of metal, Westinghouse designed both materials into the baffle of its new line of "Frost-Free" refrigerators. The finished assembly is shown above and a breakdown is diagrammed at the left. This section is responsible for the amazing automatic defrosting action of Westinghouse "Frost-Free" refrigerators. Another example of the leadership of Westinghouse.

To give Westinghouse the best performance, the *complete* knowledge and facilities of Bridgeport produced the perfect union of plastic and metal. If you, too, want to get the *most* from plastic and metal, write . . .

BPM **Bridgeport Moulded Products, Inc.**
Bridgeport 5, Connecticut

STIMSONITE* . . . Leaders in Precision Acrylic Molding . . . Choose H-P-Ms!





Trade Mark of the A. G. A. Division of the Elastic Stop Nut Corp. of America, Elizabeth, N. J.

Molding acrylic automobile tail-light lenses such as that of the 1953 Ford illustrated, incorporating the famous Stimsonite reflector, is another big production job handled 100% with H-P-M injection machines.

Close-up at left shows a typical big job handled by Stimsonite on one of their 16-oz. machines . . . a 17-oz. shot with a projected area of 84 square inches. Here's precision molding at its best!

Regardless of your molding application, whether it be acrylic, polystyrene or any other thermoplastic, you'll handle the job better and faster with an H-P-M. Investigate, now, how an H-P-M will help your production. Write for Bulletin 5204 today!

This new 16-oz. machine for Stimsonite brings their H-P-M total to 9 machines with a 32-oz. on order.

THE HYDRAULIC PRESS MFG. CO.

1010 Marion Road, Mount Gilead, Ohio, U.S.A.

Presses For Every Pressure Processing Application

make it Wellington Sears Sateen

a superior fabric for coating

Smoothness and toughness are two big reasons why Wellington Sears sateens are so often specified by the coating industry. Their high tear resistance, tensile strength and smooth weave surface insure long service life for a wide variety of good looking finished products.

Wellington Sears sateens are made up to 72 inches wide in weights of about 8 to 10 ounces per square yard. Rigid quality control in every stage of fabric production is assurance of consistent uniformity of end product.

Other Wellington Sears quality fabrics for both coating and laminating are listed at right. Many types of special constructions are also available. Whatever your fabric problem —see Wellington Sears first.

An illustrated 24-page booklet filled with valuable facts on fabric development and applications of interest to present and potential users of industrial fabrics is yours for the asking. Write for a free copy of "Modern Textiles for Industry" to Wellington Sears Co., Dept. J-3, 65 Worth Street, N.Y. 13.

Superior Fabrics for Coating and Laminating

Single filling ducks
Army ducks
Single and plied-yarn chafers
Special ducks
Sateens
Twills
Broken twills
Drills
Sheetings
Nylon, rayon and other synthetics
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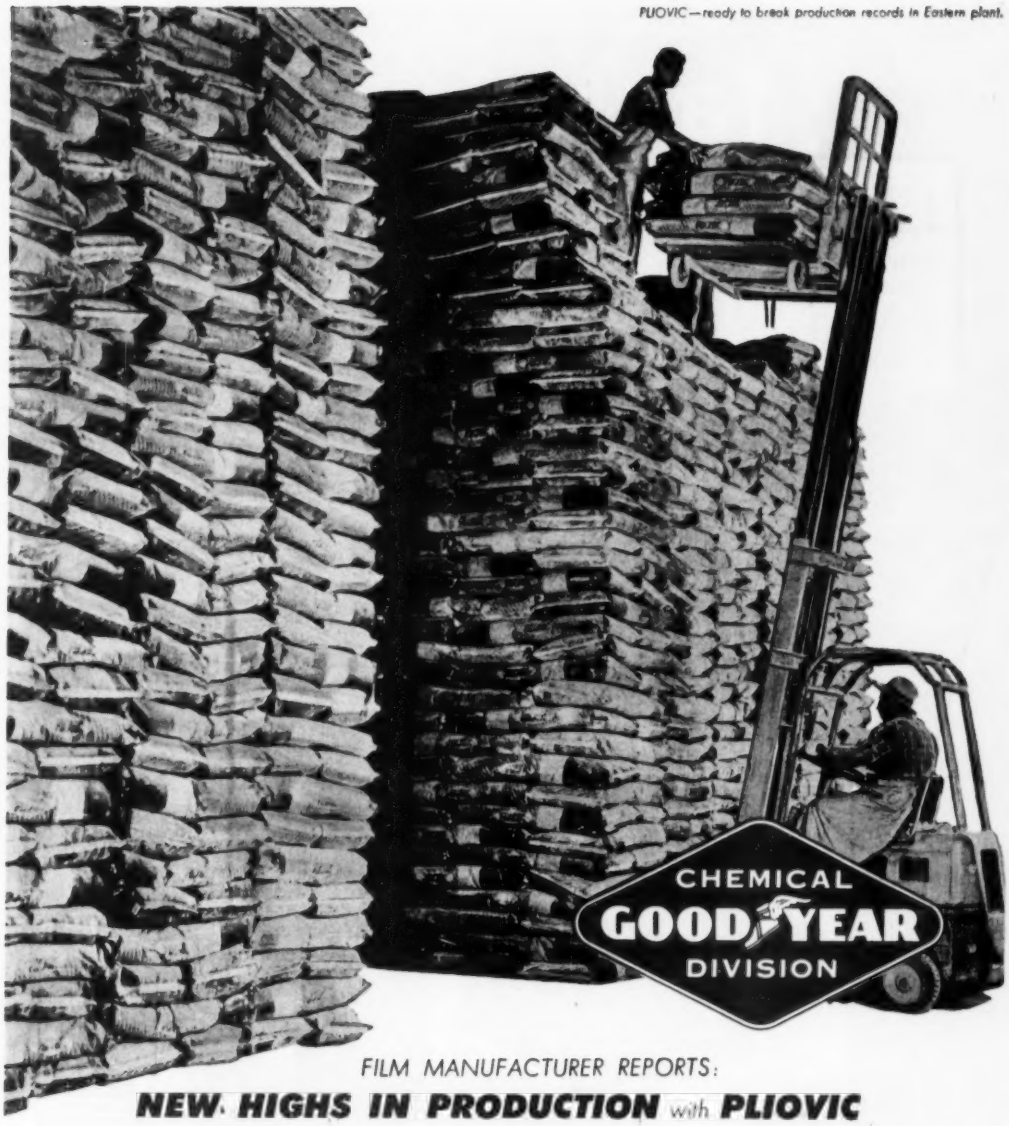
FIRST In Fabrics For Industry

WELLINGTON SEARS COMPANY, 65 WORTH STREET, NEW YORK 13, N. Y.

OFFICES IN: ATLANTA • BOSTON • CHICAGO • DETROIT • LOS ANGELES • NEW ORLEANS • PHILADELPHIA • SAN FRANCISCO • ST. LOUIS



PLIOVIC—ready to break production records in Eastern plant.

FILM MANUFACTURER REPORTS:

NEW HIGHS IN PRODUCTION with PLIOVIC

"New production record this week, last week, and the week before"—so goes the report on a large, Eastern vinyl film manufacturer. And the reason for this successively increasing production is PLIOVIC—Goodyear's polyvinyl chloride resin.

With no change in equipment and only slight modifications in compounding, this cost-conscious maker of quality film put PLIOVIC in his plant. He made a trial run and he liked what he saw. He liked the high bulk density—the easier handling. He liked the faster premixing. He liked the higher calender speeds. He liked the exceptional resistance to heat and light—the safe reworking of trim and tailings. And he liked the excellent physical properties of the finished film. Today, he and Goodyear both like the extra PLIOVIC going into his plant and the extra film coming out.

Put PLIOVIC in your plant. You'll find it to your liking, too. For full information and samples, just contact your Chemical Division representative or write to:

Goodyear, Chemical Division, Akron 16, Ohio

Chemigum, Pliobond, Pliolite, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Use-Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry

facts

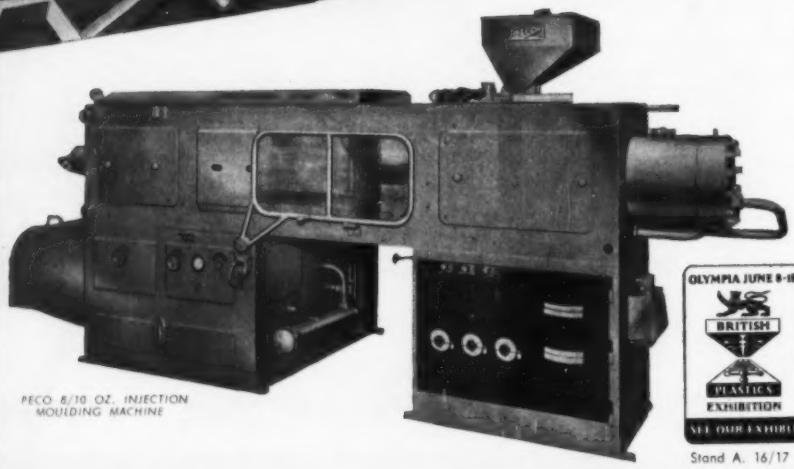
that speak for themselves

12,000
SHOTS *per* WEEK

8-impression moulding in polythene, of automobile number plate digits and letters. Mould designed and mouldings produced by the Mentmore Manufacturing Co. Ltd. in conjunction with Hills (Patents) Ltd. under Patents Nos. 661276 and 661354.

This record of weekly production can be taken as typical of the first-class performance of PECO MOULDING MACHINES. Their output can be relied on—and it is a maximum output for any type of production.

In the 8 oz. and 16 oz. machines, important new developments have been introduced, giving increased shot capacity and enabling these models to be uprated to, respectively, 8/10 oz. and 16/24 oz. machines. Further details of the full range, including smaller capacity machines, will be gladly sent on request.



PECO 8/10 OZ. INJECTION MOULDING MACHINE

OLYMPIA JUNE 8-18
BRITISH PLASTICS EXHIBITION
SEE OUR EXHIBIT

Stand A. 16/17

PECO PRODUCTS

THE PROJECTILE & ENGINEERING COMPANY LTD.

ACRE STREET, BATTERSEA, LONDON, S.W. 8, ENGLAND

Companies you can trust

...trust Norton

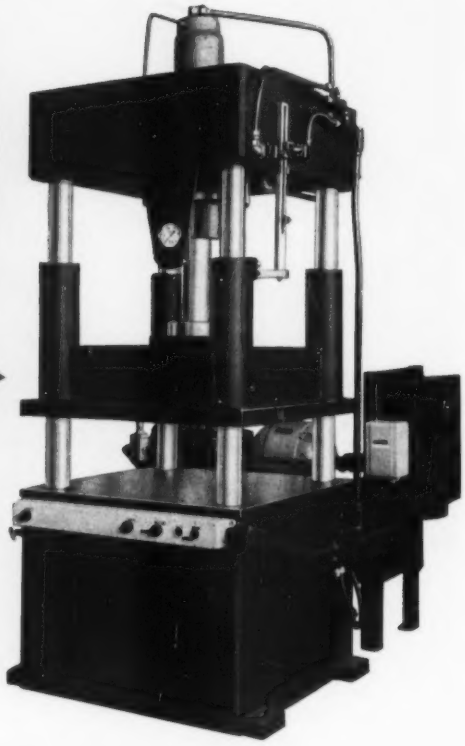
● This new, low-cost dispenser plays an important part in the merchandising plans of the Dixie Cup Company. Fountain managers, pleased with the cleanliness and ease of operation of their dispensers, constantly re-order Dixie Sundae Dishes to keep them filled. Carefully injection molded of styrene copolymer, it is typical of the fine products Norton molds and fabricates for companies with important brand names to protect. We think *you*, in the interest of sensible pricing, on-time deliveries and sound engineering, will want further information. Norton Laboratories, Inc., Lockport, New York. Sales Offices: New York—175 Fifth Avenue; Chicago—5221 Kimbark Avenue.

"Dixie" is the registered trade mark of the Dixie Cup Company, Easton, Pa.

NORTON *Laboratories, Inc.*

DAKE GUIDED PLATEN PRESS

for molding reinforced plastics



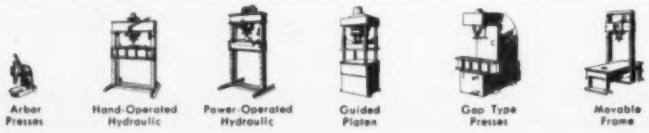
Here is a press engineered to the requirements for compression molding of reinforced plastics. It is a 75-ton 4-post double-acting platen press, electrically powered and hydraulically operated.

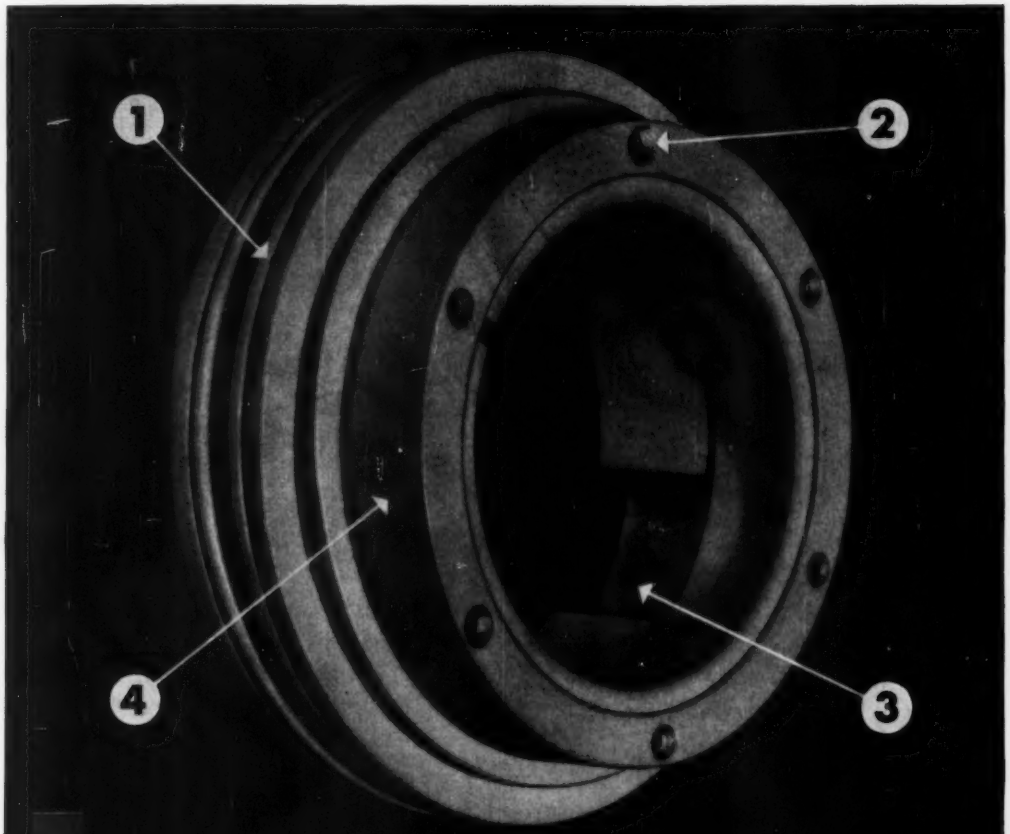
The press is equipped with a special timing device arranged so that the ram advances quickly almost to contact—then advances under full power until exactly the desired pressure is exerted on the mold. This pressure is maintained steadily throughout the curing cycle (time interval may be adjusted), after which it is released automatically and the ram returns to starting position.

Dake Guided Platen Presses, like other Dake Presses, can be engineered to your particular requirements. They are available in capacities up to 300 tons. We will gladly work with you in developing the molding press you need. A letter or phone call will put us to work.

Dake Engine Company, 648 Seventh St., Grand Haven, Mich.

DAKE PRESSES





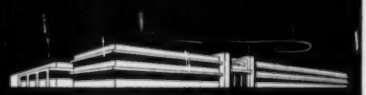
Formica fabricates laminated plastics with precision and economy

This Formica part has been (1) drilled, (2) tapped, (3) milled and (4) turned.

Formica operates the world's largest facilities for the exclusive fabrication of laminated plastics. Experienced production engineers plan the most efficient, least costly machining procedures. Skilled operators, some on the job for more than 20 years, work with the most modern equipment. Keen-eyed inspectors insure specified accuracy.

It's all yours to command when you assign laminated plastics fabrication to Formica. So trust this job to the men who know it best. You'll free your own facilities for other work. You'll find big savings in time and money.

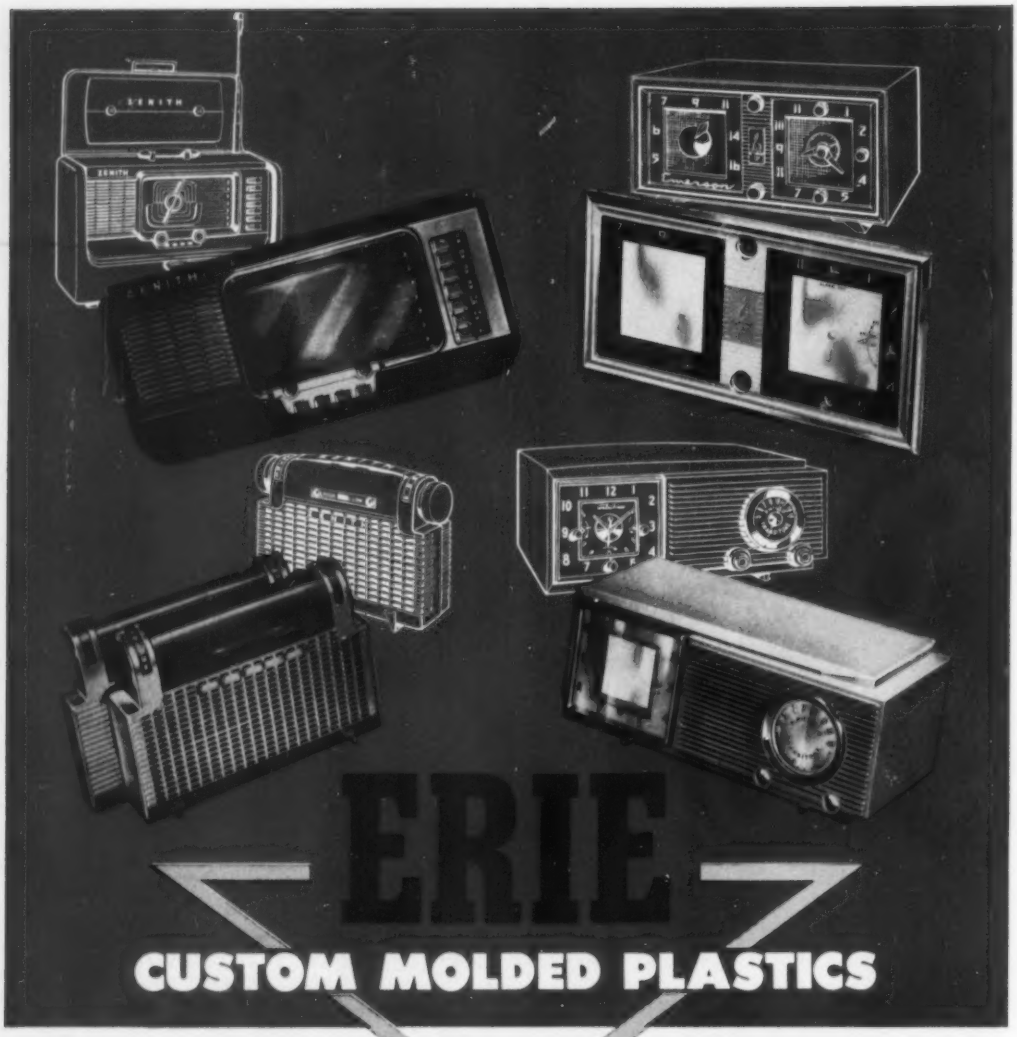
A new general catalog, yours for the asking, gives full information on Formica's 50 standard grades in sheets, tubes, rods, postformed, molded and fabricated shapes. Write for it today!



HEADQUARTERS FOR LAMINATED PLASTICS SINCE 1913

Productive FORMICA Reg. U.S. Pat. Off. Pays in Performance

THE FORMICA CO., 4531 Spring Grove Ave., Cincinnati 32, Ohio



for portable and clock radios

A portable or clock radio is a personal possession . . . as individual as a watch. Styling ranks in importance with performance . . . custom molding is called on to do the outstanding, and is high-lighted with the imperishable beauty of three dimensional plastics.

Leading manufacturers such as Philco, Zenith and Emerson, whose cases are illustrated above, have found that Erie, pioneer in custom injection molding, has kept pace with every new development in materials and in molding processes, to match the best in radio reception with the most striking in eye appeal.

Write for your copy of bulletin, "Who We Are . . . What We Do in Plastics."

25th Anniversary

ERIE

ERIE RESISTOR CORPORATION . . . PLASTICS DIVISION

Main Offices: **ERIE, PA.**

Sales Offices: Cliffside, N. J. • Philadelphia, Pa. • Buffalo, N. Y. • Chicago, Ill. Detroit, Mich. • Cincinnati, Ohio • Los Angeles, Calif.

Factories: **ERIE, PA. • LONDON, ENGLAND • TORONTO, CANADA**

TULOX® CONTAINERS

"Made by the million for products that sell by the million"

are produced on NRM extruders

YEAR after year the trend towards transparent packaging has grown with amazing speed. And year after year, in the forefront of producers has been Extruded Plastics, Inc., Norwalk, Connecticut. So great has been the growth in the demand for TULOX CONTAINERS that Extruded Plastics has added six additions to their building.

Extruded Plastics installed their first NRM Extruder, a 2½", in 1941. As Mr. Charles Slaughter, president of Extruded Plastics, puts it . . . "We had machines of two other makes both larger and smaller than our first 2½" NRM, but over the years we found that we could do a better job with the NRM 2½". Today we have standardized on NRM to the exclusion of all others."

The leaders in the field of plastics extrusion turn naturally to NRM, the leader in the field of plastics extruders. NRM built the first extruder especially designed for thermoplastics . . . designed the first electrically heated extruder . . . the "torpedo type" feed screw . . . developed balanced heat control . . . and the quick opening die gate.

Weigh this impressive record of "firsts" in extruder design with the proved performance of NRM extruders the world over — and we're sure your next extruder will be "another NRM."

® Registered TM, Extruded Plastics, Norwalk, Conn.

2116

NATIONAL RUBBER MACHINERY COMPANY

Our 25th ANNIVERSARY 1928 1953

Creative Engineering

General Offices & Engineering Laboratories: Akron 8, Ohio
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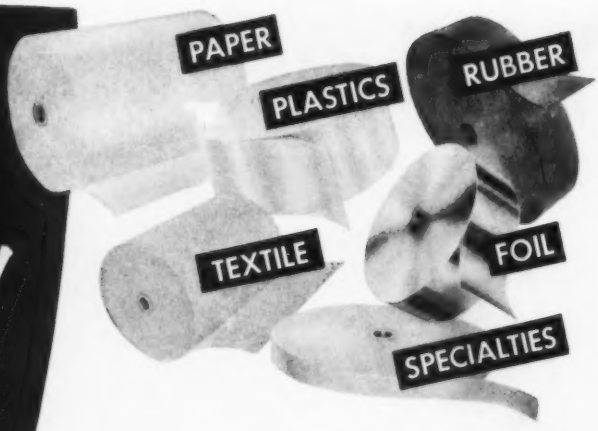
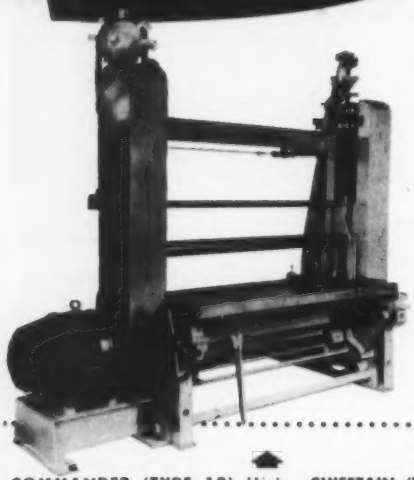
What's Your ROLL Problem!

COST? QUALITY? DELIVERIES?





Cost? Even on delicate materials, balanced Camachine construction guards against waste caused by web breaks, wrinkles and spoilage — to save time and money for you — often to improve your final product.

Quality? Thousands of users in many different industries will tell you that Camachines give you cleaner slitting, smoother winding and more sensitive tension control. See how better rolls can build your profits!

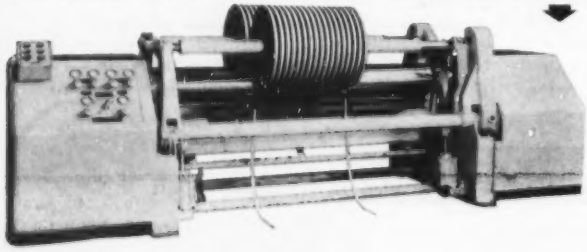
Deliveries? Fast, accurate Camachines provide flexibility in production, permitting you to store your basic materials in economy-size mill rolls. Slit and rewind the rolls you want — to the size you want — as fast as you want them.

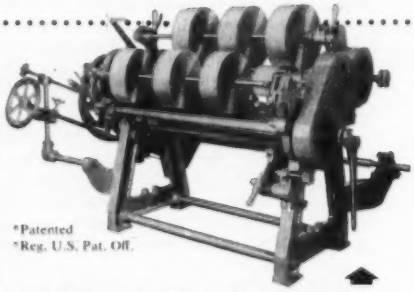
Here's a chance to get right to the heart of your roll production problem. You are invited to consult Cameron for a qualified engineering recommendation on the *right* equipment to meet your requirements. This service incurs no cost or obligation on your part.

CAMERON MACHINE COMPANY • 61 Poplar Street • Brooklyn 1, N. Y.

COMMANDER (TYPE 10) High speed slitter-rewinder for finishing and converting. Score-cut or shear-cut. Speeds to 2000 fpm. Widths 42"-82". Max. rewind dia. 40".

CHIEFTAIN (TYPE 29) Semi-automatic, heavy-duty slitter-rewinder. Features fingertip control panel. Pneucut* slitters. Speeds to 1500 fpm. Widths 42"-92". Max. rewind dia. 36".





*Patented
*Reg. U.S. Pat. Off.

Type 26 Versatile slitter-rewinder for many different materials including lighter gauge plastic film. May use Pneucut* pneumatic score-cut or razor type slitter elements. Speeds to 500 fpm. Widths 26"-62". Max. rewind dia. 17¾".

AA-268

LOOK FOR EFFICIENCY AND YOU'LL WIND UP WITH Camachine®

This is a standard vinyl electrical insulation . . .

This is a vinyl insulation for high temperature use

There are proved "Dutch Boy" Stabilizers for both of these compounds

Today, makers of vinyl electrical insulations are heavy users of three "Dutch Boy" stabilizers... Tribase, Tribase E, and Dythal.

Tribase and Tribase E, manufacturers find, give them the desired electrical properties plus the processing advantages that recommend these two stabilizers for standard insulations. Both give vinyls exceptional heat stability, eliminating gassing and other stabilizer breakdowns. And both can be dispersed easily throughout the formulation.

"Dutch Boy" Dythal, they find, does an outstanding job for high temperature vinyl insulation. Not only does it impart good electrical properties, but it also gives excellent heat stability in formulating vinyl insulation for high temperature use. Its low tinting strength, they say, makes bright colors possible. Manufacturers also find it's easy to disperse "Dutch Boy" Dythal . . . and easy to extrude compounds containing it.

Whenever a problem arises in your plant involving vinyl insulation stabilization, consult our technical staff. For information on "Dutch Boy" Tribase, Tribase E, and Dythal, write us.

"Dutch Boy" Stabilizers

PRODUCT	USE
[redacted]	Electrical and other compounds requiring high heat-stability
[redacted]	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
[redacted]	General purpose stabilizer for heat and light. Good electrical properties
DYPHOS (Dibasic Lead Phosphite)	Outstanding for heat and light in all opaque stocks, including plastisols and organosols
NORMASAL (Normal Lead Salicylate)	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light-stability
BARINAC (Barium Ricinoleate)	Stabilizer-lubricant for clears

Dutch Boy®

*Reg. U. S. Pat. Off. **CHEMICALS** *

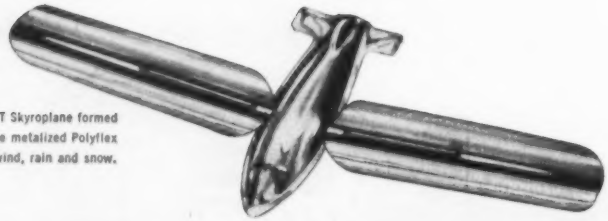
NATIONAL LEAD COMPANY
111 Broadway • New York 6, N. Y.
In Canada: **CANADIAN TITANIUM PIGMENTS LIMITED**
630 Dorchester Street, West • Montreal

ZENITH processes

produce prize contributions to America's progress in commerce

The prize-winning Eames chair is one example of Zenith skill in reinforced plastic fabrication. If you have a problem of production in a part or product, Zenith's specialized experience in this medium may give the answer. For details, contact

ZENITH PLASTICS CO. Gardena, California



MIRROR-BRIGHT Skyroplane formed of .0065" gauge metalized Polyflex stands up to wind, rain and snow.

METALIZED POLYFLEX®

RICHNESS OF PLATED OR CLAD METALS AT A FRACTION OF THEIR COST

Metalized Polyflex looks, feels, even sounds like metal — but it will do things metal can't do. Yet it costs only a fraction as much. Made of the most heat resistant polystyrenes, Polyflex is strong, offers rigidity in a wide variety of gauges, and flexes easily. It lies flat and won't curl, shrink or wrinkle with age. Its mirror-like surface is water-resistant. Many different metallic colors are available in plain high gloss finish or with embossed, etched or printed patterns.

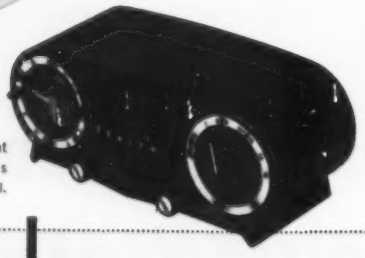
Possible uses of metalized Polyflex are infinite. If you want that money-making, polished metal look, at low cost, investigate metalized Polyflex.

ONE-WAY MIRROR effect of metalized Polyflex adds exciting feature to this Tom Corbett Space Helmet.

QUALITY LOOK is given this freezer compartment door by gold and silver-colored Polyflex under clear styrene.

BASIC FEATURES OF POLYFLEX

- Continuous Service Temperature — up to 175°F
- High Rigidity — use lighter gauges
- Excellent Dimensional Stability Under Wide Climatic Conditions
- Water Absorption — nil
- Lays flat — stays flat
- Highest "Sparkle" gloss
- Colors — Unlimited possibilities from water clear to opaque
- Odorless, tasteless, non-toxic
- Excellent Electrical Characteristics
- Excellent Acid & Alkali Resistance
- Available gauges — .003" through .020"
- Can be printed, formed, stamped, cemented



METALIZED POLYFLEX makes brilliant decorations for dials and panels with no protective covering required.

WHERE TO BUY METALIZED POLYFLEX:

Metal Film Co., Inc.
200 Fifth Ave., New York, N. Y.
Trade name: Hy-Siltone

Coating Products Co.
136 West 21 St., New York 11, N. Y.
Trade name: Mirro-Brite

PLAX CORPORATION

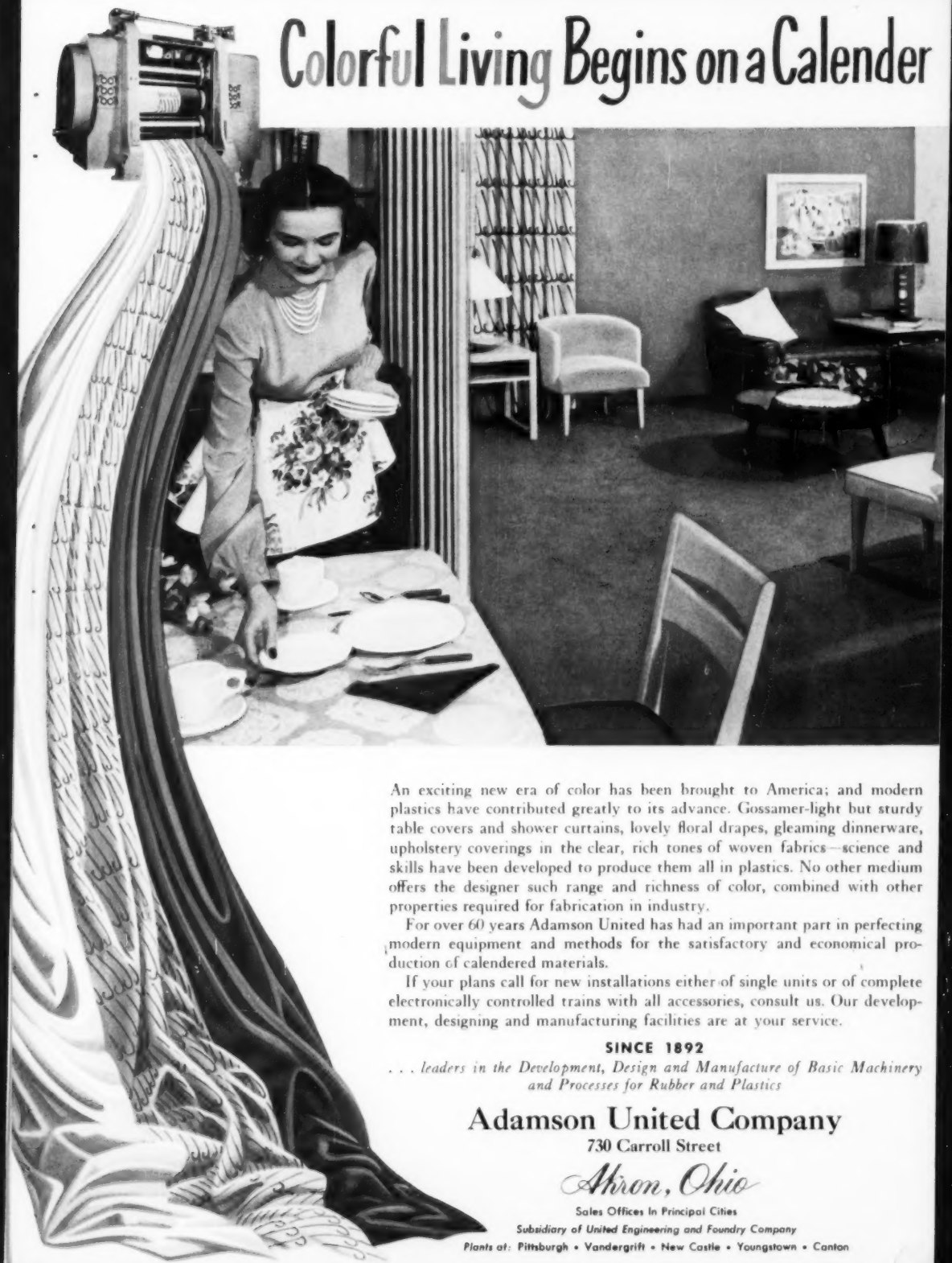
SUBSIDIARY OF EMHART MFG. CO.

WEST HARTFORD, CONNECTICUT

IN CANADA: Plax Canada, Ltd., Toronto • DISTRICT SALES OFFICES: New York, Philadelphia, Chicago and other principal cities

PLAX

Colorful Living Begins on a Calender



An exciting new era of color has been brought to America; and modern plastics have contributed greatly to its advance. Gossamer-light but sturdy table covers and shower curtains, lovely floral drapes, gleaming dinnerware, upholstery coverings in the clear, rich tones of woven fabrics—science and skills have been developed to produce them all in plastics. No other medium offers the designer such range and richness of color, combined with other properties required for fabrication in industry.

For over 60 years Adamson United has had an important part in perfecting modern equipment and methods for the satisfactory and economical production of calendered materials.

If your plans call for new installations either of single units or of complete electronically controlled trains with all accessories, consult us. Our development, designing and manufacturing facilities are at your service.

SINCE 1892

. . . leaders in the Development, Design and Manufacture of Basic Machinery and Processes for Rubber and Plastics

Adamson United Company

730 Carroll Street

Akron, Ohio

Sales Offices In Principal Cities

Subsidiary of United Engineering and Foundry Company

Plants at: Pittsburgh • Vandergrift • New Castle • Youngstown • Canton

I.C.I. PLASTICS

Serve the Lighting Industry

The lanterns for fluorescent lamps in London's Marylebone Road (installed by the General Electric Co. Ltd. of England) have clear 'Perspex' covers. 'Perspex' has extremely high light-transmission throughout the visible range, and its excellent optical properties are unaffected by the weather and by long exposure to ultra-violet light.

'Perspex' is easy to shape, and —where light control by refraction is required— prismatic plates can be efficiently and economically machined from it.

For other lighting applications 'Perspex' is available in a wide range of colours as well as in clear and opal. There are several opal grades having different transmission, reflection and diffusion factors.

Plastics manufactured by I.C.I. for the lighting industry also include 'Welvic' P.V.C. for cable insulation and white rigid P.V.C. sheet for lamp reflectors.

The supply of these products is backed by technical advice based on wide experience of plastics for lighting.

'Perspex' and 'Welvic' are registered trade marks, the property of I.C.I.

IMPERIAL CHEMICAL INDUSTRIES LIMITED

Plastics Division, Black Fan Road, Welwyn Garden City, Herts., England.

U.S.A. enquiries to: **J. B. HENRIQUES, INC.,** *521 Fifth Avenue, New York, 17.N.Y.*

P.137M

Adamson United maintains gage uniformity by using TIMKEN® bearings on roll necks

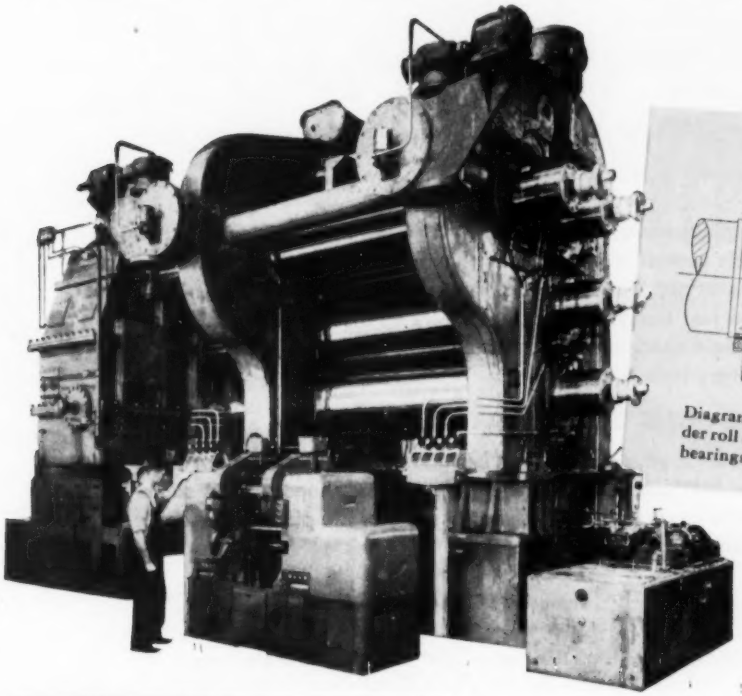
THE rolls of the Adamson United 36″ x 92″ and 8″ x 16″ 4-roll calenders shown below are mounted on Timken® tapered roller bearings. As a result, accurate gage of plastic film is maintained longer than is possible with sleeve type bearings. Rolls stay in accurate alignment maintaining uniform gage the length of the sheet.

By eliminating friction between roll neck and bearing, Timken bearings eliminate roll neck wear. The calender maintains precision with fewer overhauls, and downtime is reduced because roll necks don't require regrinding. Wear within the Timken bearings themselves is negligible because of their true rolling motion and smooth surface finish of rollers and races.

The gear stand driving the larger calender is also equipped with Timken bearings—a total of 19.

Tapered construction of Timken bearings permits them to take both radial and thrust loads in any combination. Due to line contact between rollers and races, Timken bearings have load capacity to spare. Get the advantages of Timken bearings in your calenders, mills, refiners, and mixers. For full information, write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



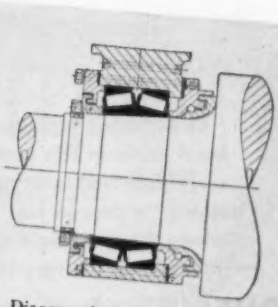
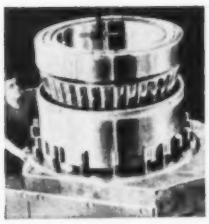


Diagram shows typical calender roll application of Timken bearings.



ROLL NECK BEARING ENGINEERING SERVICE

Our field and service engineers have had years of experience with problems of roll neck bearing design and operation. They'll help you select bearings and design mountings. The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

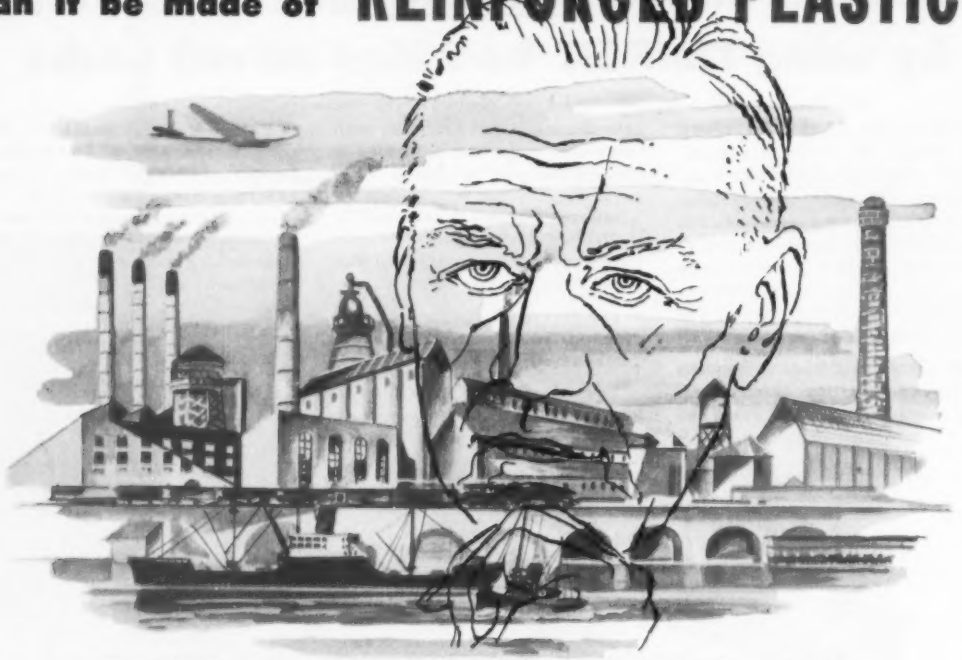
TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION

Can it be made of REINFORCED PLASTIC?



Remarkable achievements, surpassed only by those in atomic energy, have been made in this newest branch of the plastics industry in the past few years.

So rapid is its progress that "the impossible of yesterday" invariably has become "a proven fact today." Accepted initially by the aviation field, where the most rigid specifications had to be met, reinforced plastics are now winning favor in every industry.

Let RUSSELL give you the answer

Don't just wonder if your product can be made of this most modern of all materials. Let RUSSELL give you the answer, and perhaps suggest some applications you have never even dreamed of. As one of the pioneers in the field, we are especially qualified because:

- Our large staff of chemists, engineers and technicians have the "know-why" acquired from diversified experience.
- Our production crew furnishes the "know-how" with the aid of scores of presses from midgets to mighty 700 ton giants. Consequently there are few limitations as to the size or shape of your products.
- We produce by all the major processes including:

FLAT PANELS • PREFORMING • MATCHED DIE MOLDING • SANDWICH CONSTRUCTION

If you want to save time . . . consult RUSSELL first!

Repco Plastics*

by Russell REINFORCED PLASTICS CORP.

WEST HOFFMAN AVENUE • LINDENHURST, L.I., N.Y.

Lindenhurst 5-1700

*TM Reg.

Representatives in LOS ANGELES • KANSAS CITY • TOLEDO • MIAMI • ATLANTA • TORONTO

when

NON-MIGRATION

and

RESISTANCE TO EXTRACTION

are essential

IN INDUSTRY . . .

insulation tape

IN THE HOME . . .

boilable baby pants

formulate with

FLEXOL*

plasticizer R-2H

a polymeric plasticizer for Vinyl Chloride Resins

• non-volatile • non-marring • soapy-water resistant • oil resistant • excellent electrical properties

performance proved in

• pressure sensitive tapes • boilable baby pants • high-temperature insulation • gaskets

IMMEDIATE SHIPMENT IN CARLOAD LOTS

for Further Information

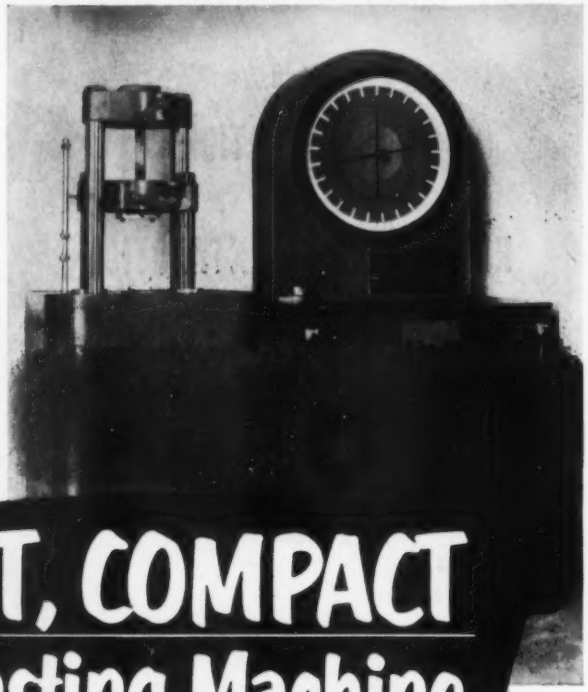
Call the nearest of our 21 sales offices or write for our Technical Information Sheet on FLEXOL *Plasticizer R-2H. When writing, ask for Form 7855. In Canada: Write to Carbide and Carbon Chemicals, Ltd., Toronto.*

*The term "Flexol" is a registered trade-mark of Union Carbide and Carbon Corporation.

CARBIDE AND CARBON CHEMICALS

Carbide and Carbon Chemicals Company
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, UCC, New York 17, N. Y.

Universal Testing Machine Model 60-H with T.E.G. load indicator



Now Baldwin Testing Headquarters Meets Your Needs With This New

LOW COST, COMPACT Universal Testing Machine

Recognizing your need for a low cost, faster and compact Universal Testing Machine, Baldwin-Lima-Hamilton Testing Headquarters developed Models 60-H and 12-H.

Quantity production makes possible fast deliveries and lower cost; nevertheless, the quality is so fine that its use in research laboratories is justified, particularly when equipped with the new T. E. G. load indicator.

With one of these new machines you would gain all of these advantages: (1) The first low cost machine which exceeds all minimum requirements for the routine testing job. (2) Faster, more rugged, more foolproof and able to stand more abuse than any comparable machine. (3) Operational damage prevented by simple safety devices. (4) One unit design with two unit features . . . will fit area only 67½" by 27"! Indicator housing supported independently to eliminate transmission of recoil. (5) Adjusting screws are completely enclosed in base and lubricated for life, eliminating worry and care. (6) Practically noiseless operation. Single knob control for loading and return.

For full information about the specifications and capabilities of this machine, write for our new Bulletin 4204 to: Dept. 2126, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

TESTING HEADQUARTERS

BALDWIN-LIMA-HAMILTON

General Offices: Philadelphia 42, Pa. • Offices in Principal Cities

In Canada: Peacock Brothers, Ltd., Montreal, Quebec

You'll Be Proud of the Products

Ideal INJECTION MOLDS FOR YOU

A LOOK AT some recent products Ideal Plastics has custom molded will give you a clear picture of the quality work we do. You will find these injection molded pieces to be notable for their flawless structure. You will discover they were molded for important companies which are known throughout the land.

With our matchless facilities for molding, fabricating, and finishing, Ideal constantly creates molded pieces on which discriminating manufacturers are proud to place their names.

Ideal's cooperative staff stresses *service*. You get exactly what you want, exactly when you want it. And, in this day of the inelastic dollar bill, Ideal's realistic pricing is probably more than you would bargain for.

If you take pride in your product, Ideal's custom injection molding service will be of more than casual interest. For facts you can act on, send details about your requirements to A. C. Manovill, Ideal's Vice President in Charge of Sales. Ideal Plastics Corporation, 184-10 Jamaica Ave., Hollis 7, N. Y. Phone: AXtel 7-7000. Mid-west Representative, Steel Mill Products Co., 176 West Adams St., Chicago 3, Ill. Phone: CEntral 6-5136.

This polystyrene "Treasure Chest," custom molded in several colors by Ideal, is used as a container for scarves, handkerchiefs, silk stockings and other gift and novelty items.

Better Molded Plastics Ideal *for Industry & Home*

In the Lab...OR on the Line
Quality Control means More Profit

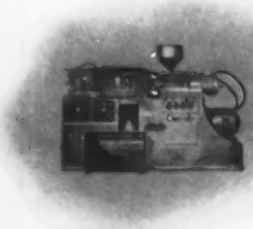
That's why a leading producer of basic plastics selected this Standard Fellows 1B-3-15

The molding of tensile test bars is a vital first step in the maintenance of quality control. Complete dependability and consistent molding machine performance is essential. Accurate control of time, temperature, pressure and other variables must be established beyond question.

The selection of Fellows 1B-3-15's (a production line model) for this exacting job shows the kind of performance you can expect.

To easy and economical handling, and the profit-making production speeds of Fellows Injection Molding Machines you can add their flexibility on the production line.

We suggest your personal investigation and examination. Call us now. See addresses below.

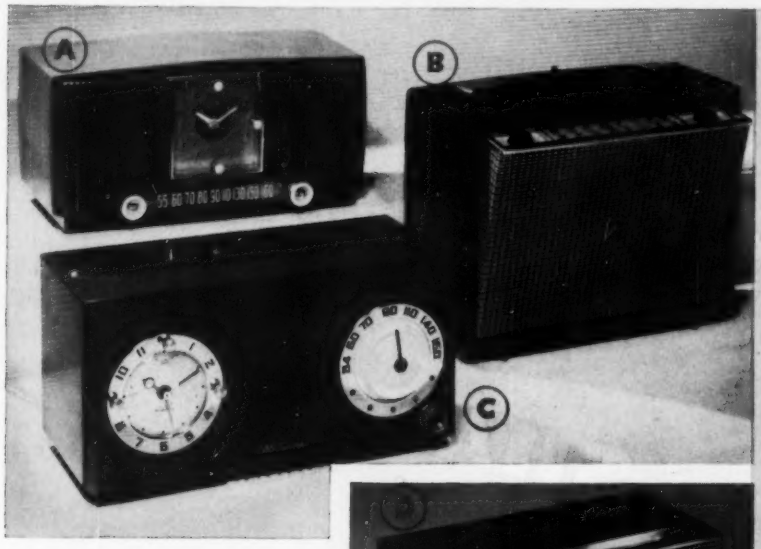


Fellows
injection molding equipment

THE FELLOWS GEAR SHAPER COMPANY, Plastics Machine Division, Head Office and Export Department, Springfield, Vermont
Branch Offices: 323 Fisher Bldg., Detroit 2, Michigan • 5835 West North Avenue, Chicago 39, Illinois • 2206 Empire State Bldg., New York 1, N. Y.

Koppers Polystyrene in Radio...

an ideal material for cabinets!



A **General Electric Company**
Molder — General Electric Company, Chemical Div., Pittsfield, Massachusetts

B **Motorola Inc.**
Molder — Chicago Molded Products Corporation, Chicago, Ill.

C **CBS-Columbia, Inc.**
Molder — Jamison Plastics Corp., New York, New York

D **Philco Corporation**
Molder—Erie Resistor Corp. Erie, Pennsylvania

E **Emerson Radio and Phonograph Corp.**
Molder—Erie Resistor Corp. Erie, Pennsylvania

F **Zenith Radio Corporation**
Molder—Erie Resistor Corp. Erie, Pennsylvania

A variety of desirable characteristics has built a demand for Koppers Polystyrene as a material for radio cabinets and cases. Its light weight has made it particularly suitable for portable radios.

In addition to light weight, the ability to remain unaffected by the constant heat of a radio in operation is absolutely necessary. The heat stability of Koppers Polystyrene Type 8 is more than sufficient to satisfy this requirement. Strength, ease and speed of molding, dimensional stability for perfect mating of sections, and low cost are other characteristics of Koppers Polystyrene which make it a favorite material with manufacturers and molders.

Customers are attracted to radio cabinets of pleasing colors made possible by the use of Koppers Polystyrene. Manufacturers and molders have found that Koppers has eliminated the risk of visual variations in color. Koppers method of Color Matching and Control assures adherence to color specifications within exacting tolerances unsurpassed in the industry.

Write today for information about the suitability of Koppers Polystyrene for your product. A Koppers representative will be happy to call and discuss your specific product needs.

KOPPERS®

Koppers Plastics Make Many Products Better and Many Better Products Possible.

Koppers Plastics

Guaranteed by Good Housekeeping

KOPPERS COMPANY, INC., Chemical Division, Dept. MP-53, PITTSBURGH 19, PA.

SALES OFFICES: NEW YORK • BOSTON • PHILADELPHIA • CHICAGO • DETROIT • LOS ANGELES

should your plastic product have these qualities?

- Flame resistance
- High resistance to water, oil, gasoline
- High permanence on heating
- Excellent electrical properties
- High tensile strength
- High flexibility, even at low temperature
- Low migration

or any combination of the above?

...then you can probably cut plasticizer costs with

MPS-500®

BULLETIN 35 gives you properties of MPS-500; comparisons with other plasticizers; detailed test data; typical formulations and uses. Write today, on your company letterhead, for a copy.

MPS-500 is a stabilized, chlorinated ester of a fatty acid. It shows excellent compatibility with vinyl chloride polymers and copolymers. Its low cost and valuable properties make it well worth investigating, for use alone or with other plasticizers.

• Hooker laboratories are fully equipped to test and evaluate plastic compositions. We are glad to help you solve problems where MPS-500 may be of interest. Your inquiry is invited.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

18 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.
CHICAGO, ILL • NEW YORK, N. Y. • LOS ANGELES, CALIF. • TACOMA, WASH.

HOOKER CHEMICALS

1-866

CAUSTIC SODA • CHLORINATED PARAFFIN • CHLOROBENZENE • CHLOROTOLUENE • CYCLOHEXANOL • MURIATIC ACID • SULFUR CHLORIDE

The Little Big Shot in Plastics!

Small but powerful . . . the **LEWIS "4"** is the lowest cost machine available today for production molding of lightweight large-area parts. Only the **LEWIS "4"** can mass produce 2 to 3-ounce parts in molds originally designed for 8-ounce machines. It's compact . . . simple to operate . . . economical to buy and use.

The **LEWIS "4"** features semi-automatic operation, multiple shot injection and full-mold high-pressure injection at low plunger pressures. Exclusive fast-opening crank-operated die-lock mechanism permits operator to release dies and clear jammed nozzles in 20 seconds or less without leaving the operating panel.

The **LEWIS "4"** handles almost any molding material and accommodates molds up to 12x23" mounted vertically and 13⅜x20" horizontally . . . yet it requires only 16 sq. ft. of floor space and operates so quietly you can use it anywhere.

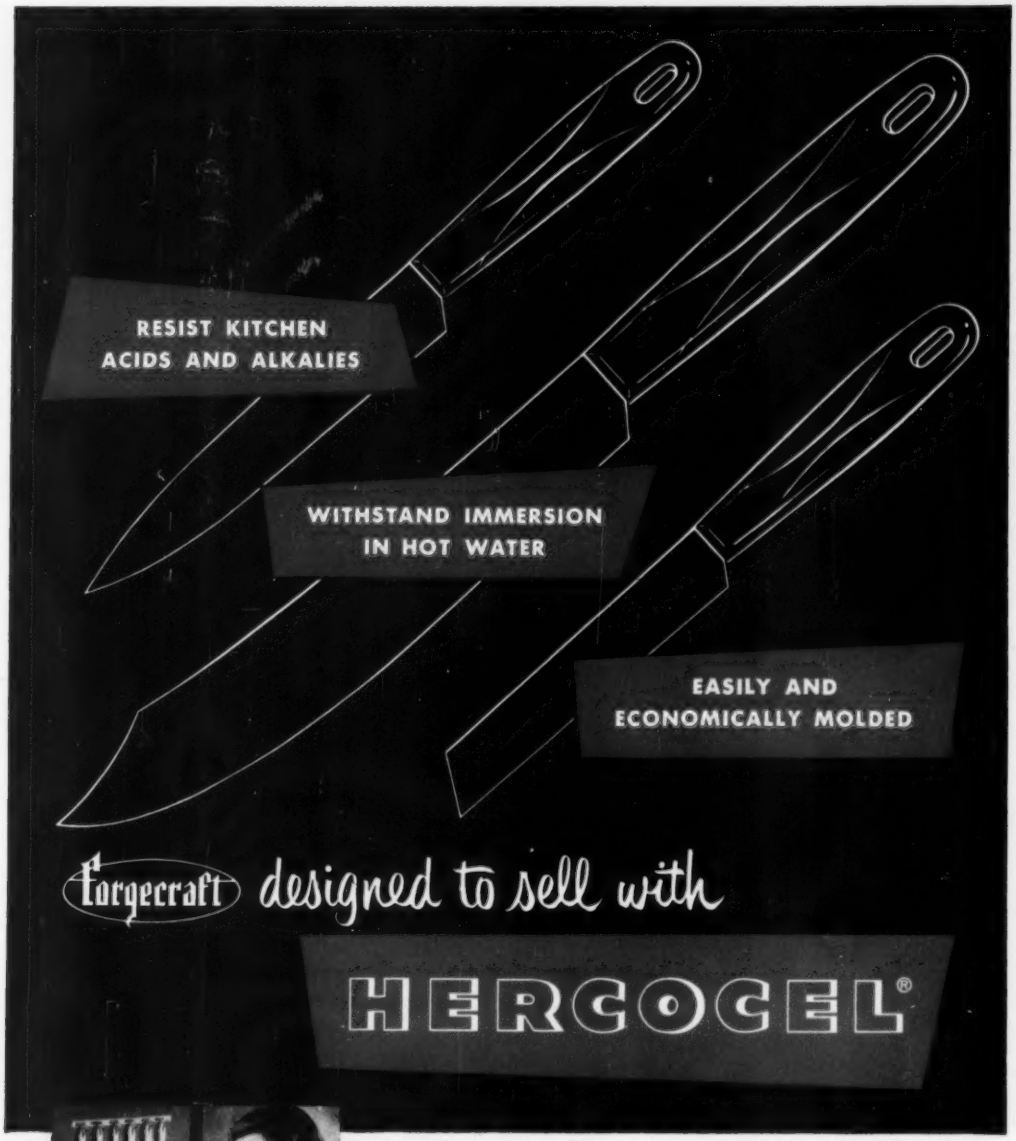
Dollar for dollar, the LEWIS "4" gives you more!

Write today for illustrated Catalog No. 101 for additional details

1093-LW

LEWIS **THE LEWIS WELDING & ENGINEERING CORPORATION**

11 INTERSTATE STREET • BEDFORD, OHIO



Forgecraft designed to sell with

HERCOCEL®

Duraset handles made from a special high-acetyl formulation of Hercocel A are a feature of Washington Forge's line of kitchen tools. Durable, colorful, attractive, these handles resist kitchen greases, fruit and vegetable acids, and alkaline soaps and detergents. Electronically sealed to the metal sections, they will not loosen. Most important, high-acetyl Hercocel permits repeated immersion in hot water, and safe cleansing in modern home dishwashers. For more information on versatile Hercocel, including a new flame-resistant type, and Hercules design and technical assistance, write:

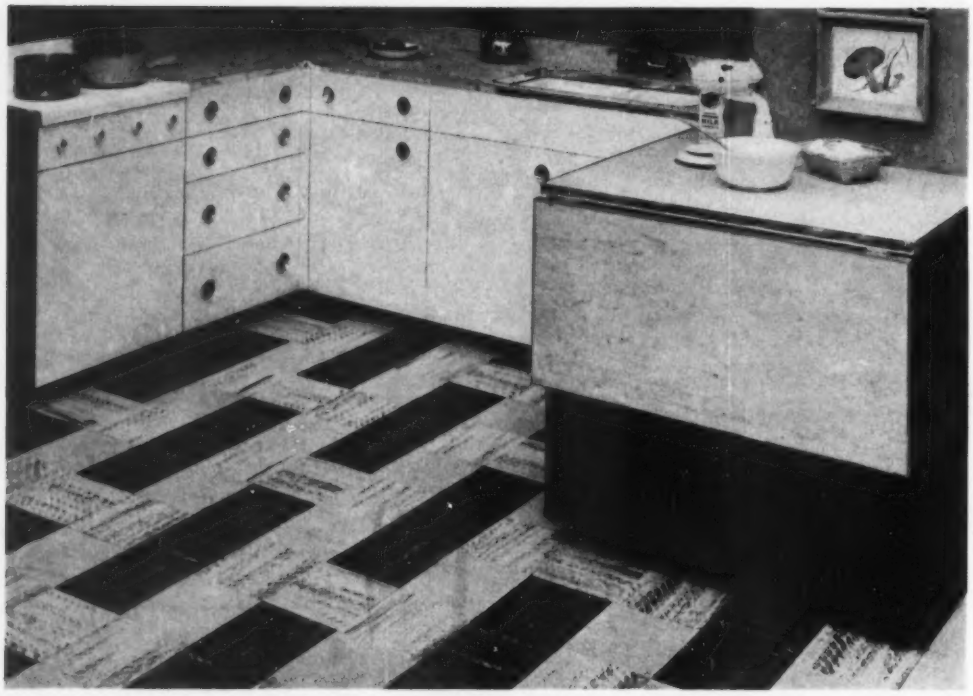
HERCULES POWDER COMPANY

Cellulose Products Department, 916 Market Street, Wilmington 99, Del.

Handles molded for Washington Forge, Inc., Englishtown, New Jersey, by Laurel Plastics Company, Lakewood, New Jersey.

CP53-4

These smooth floors defy



Kitchen Floors look better, longer, when they're covered with Flor-Ever Plastic Flooring. Made from Firestone EXON Resins, the finish cannot be marred by water, grease, cleansers.

Bedroom Floors gleam in a jiffy, because, thanks to EXON Resins, dirt and dust cannot penetrate Flor-Ever's hard finish.

rough treatment...

Flor-Ever PLASTIC FLOORING...

made with Firestone EXON *RESINS*

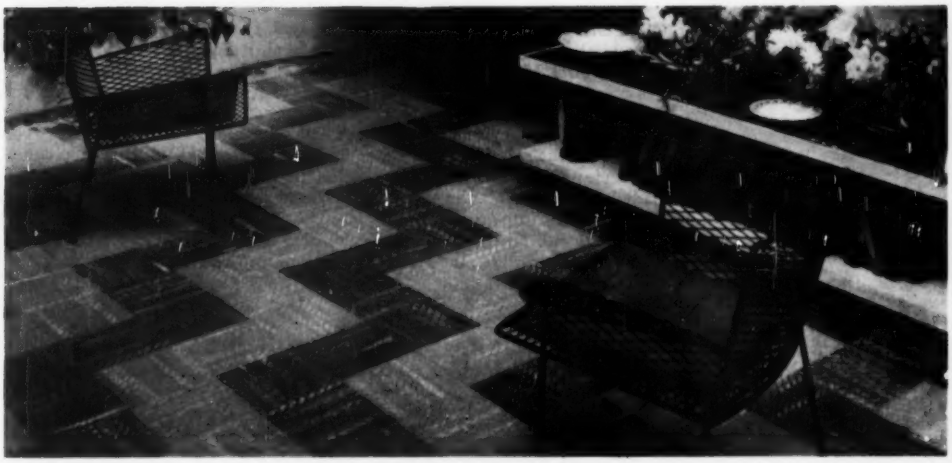
Flor-Ever Plastic Floor Covering, manufactured by the Delaware Floor Products Division of Congoleum-Nairn, Inc., is famous for beauty, versatility and long life. Flor-Ever is easy to keep bright and new-looking, because dirt cannot penetrate its hard finish. What's more, it cannot be harmed by water, grease, soap, cleansers...even strong acid or alkali solutions.

Like Delaware Floor Products, many manufacturers of plastic products are specifying Firestone EXON Resins for all types of applications. The reason is...these fine resins are extremely *versatile.*

EXON Resins can help solve your problem. If you're looking for corrosion resistance or abrasion resistance...heat stability or light stability...chemical inertness or electrical properties...physical toughness or general processability...be sure to consider the resins in the EXON line.

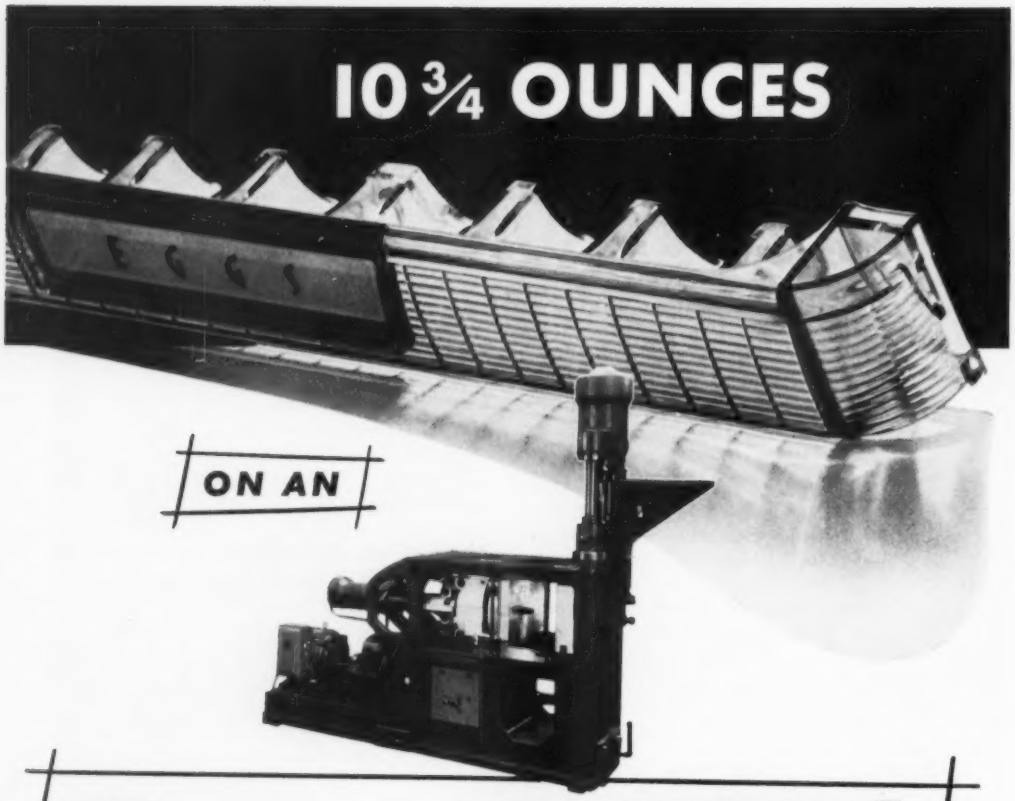
Firestone's staff of technically-trained experts will be glad to advise you on possible practical applications of EXON Resins to solve your particular problem. For recommendations in reference to a specific application... or for detailed information on the entire EXON line, write or call:

Chemical Sales Division, DEPT. 12 B
FIRESTONE PLASTICS CO., POTTSTOWN, PA.



Living Room Floors stay bright and colorful. EXON Resins impart toughness that enables them to stay new-looking even after years of service.

10 3/4 OUNCES



ON AN

8 OUNCE LESTER!

AT SINKO MFG. AND TOOL CO. in Chicago, if you ask Howard Nielsen, Treasurer and General Manager, about the new L-2-8 ounce Lester, he'll tell you, "what a lifesaver." When they had to run the polystyrene egg-tray compartments shown here for the Admiral refrigerator, the 32 ounce press where it usually runs was loaded. Even though the part weighed 10-3/4 ounces in polystyrene, they decided to try the mold in their new Lester to see what would happen. They saw! It started running and they were in production—and at a cycle competitive to the 32! What a wonderful feeling for a molder to know that his machines have that extra capacity in a tight spot.

The 8 ounce Lester is rated in polystyrene and has 350 tons of locking pressure. It will take an 1823 DME mold base. Write for complete specifications on the machine whose capacity is suited to your needs. And ask for a free copy of the Lester-Phoenix house organ, "The Lester Press".

LESTER INJECTION MOLDING MACHINES

REPRESENTATIVES

New York	Steven F. Krould	Cincinnati	Index Machinery Corp.
Detroit	Theresen-McCosh	Los Angeles	Seaboard Machinery Co.
Chicago	J. J. Schmidt	San Francisco	J. Fraser Rae
Cleveland	Don Williams	St. Louis, Milwaukee	A. B. Geers
		Providence	Sydney W. Lohman

FOREIGN

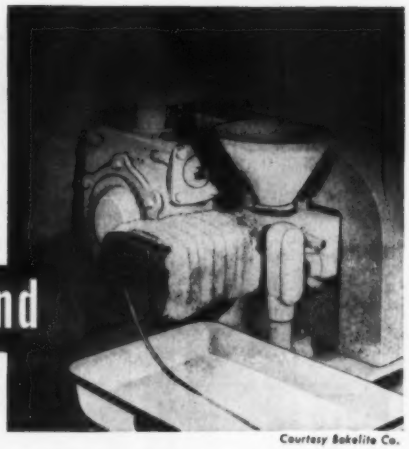
Toronto, Canada	Modern Tool Works, Ltd.
London, England	Dowding & Doll, Ltd.
Sydney, Australia	Scott & Holladay, Ltd.
Japan	Okura & Co., New York, Inc.

distributed by LESTER-PHOENIX, INC., 2621-J CHURCH AVENUE • CLEVELAND 13, OHIO

METASAP* STEARATES

Courtesy Boonton Molding Co.

...and



Courtesy Bakelite Co.

superior lubricants in molding compounds

outstanding thickeners for plastisols

Metasap Calcium and Zinc Stearates are unsurpassed as lubricants — in molding compounds, or when dusted onto surfaces of mold cavities. Molders using them eliminate preform delamination, and breakage of finished products, because all *ejection pressures are minimized.*

If the importance of economy cannot be overemphasized in your compression molding, you'll find *nothing more profitable* than Metasap stearate lubrication. Metasap Calcium and Zinc Stearates will assure improved preforms, improved finished products, and increased output *at less cost.*

If you manufacture plastigels, look to Metasap Stearates. Not only have these quality metallic soaps proved *successful gelling agents,* but their *ready availability* and *basic economy* offer advantages you cannot afford to overlook. We'll be pleased to provide samples of —

Metasap Magnesium Stearate
Metasap Barium Stearate
Metasap Calcium Stearate
Metasap Aluminum Stearate

at no cost and without obligation, to help you select just the thickener, or thickeners, you find best for the plastisols you are handling.

*Reg. U. S. Pat. Off.

METASAP CHEMICAL COMPANY REG. U.S. PAT. OFF.

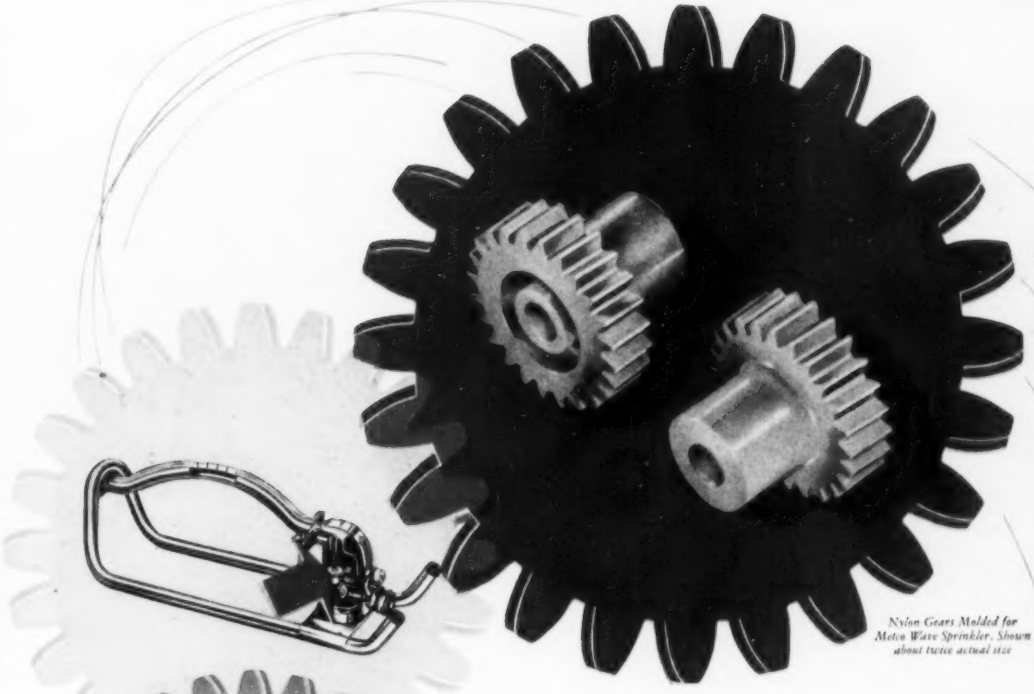
For complete information, write

METASAP CHEMICAL COMPANY, HARRISON, N. J.

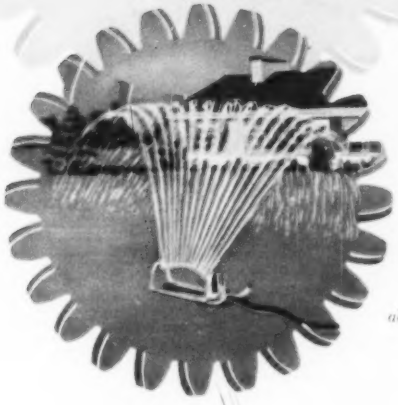
Chicago • Boston • Richmond, Calif. • Cedartown, Ga.

Stearates

of Calcium • Aluminum • Lead • Magnesium • Zinc



Nylon Gears Molded for Metco Wave Sprinkler. Shown about twice actual size



Skillful Molding

DOES A WELL GEARED JOB

". . . For long life with low wear, a non-metallic gear was a design requirement for the Metco Wave Sprinkler. We chose molded gears for economy and because of the wide range of materials which can be molded. We chose nylon as the molding material because of its high wet strength, low moisture absorption and abrasion resistance when operated with water as the only lubricant."

This excerpt from a letter by Mr. C. K. Wilson, Design Engineer for Metallizing Engineering Company, Long Island City, New York, effectively presents a strong case for molded gears.

If Mr. Wilson had continued in that vein, he might also have said, "We chose Elmer E. Mills Corporation because it is one of the few molders in the country equipped to mold nylon gears."

Why? Because this type of thermoplastic molding presents a challenge few molders care to meet. Since these were undercut "helical" gears instead of the straight "spur" gears, their production presented an unusually difficult job of molding and tool making. Despite the fact that only a few molders can make them, the use of thermoplastic gears is very much on the increase.

Wherever they are used, it is either a case of greater production economy, functional superiority, or both.

So when you are studying the problem of gears for your products, consider the advantages of nylon or other thermoplastic gears. Then let us show how well geared we are to solve this problem for you.

Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about [redacted] piping, tubing and fittings, write for circulars containing data and illustrations.*

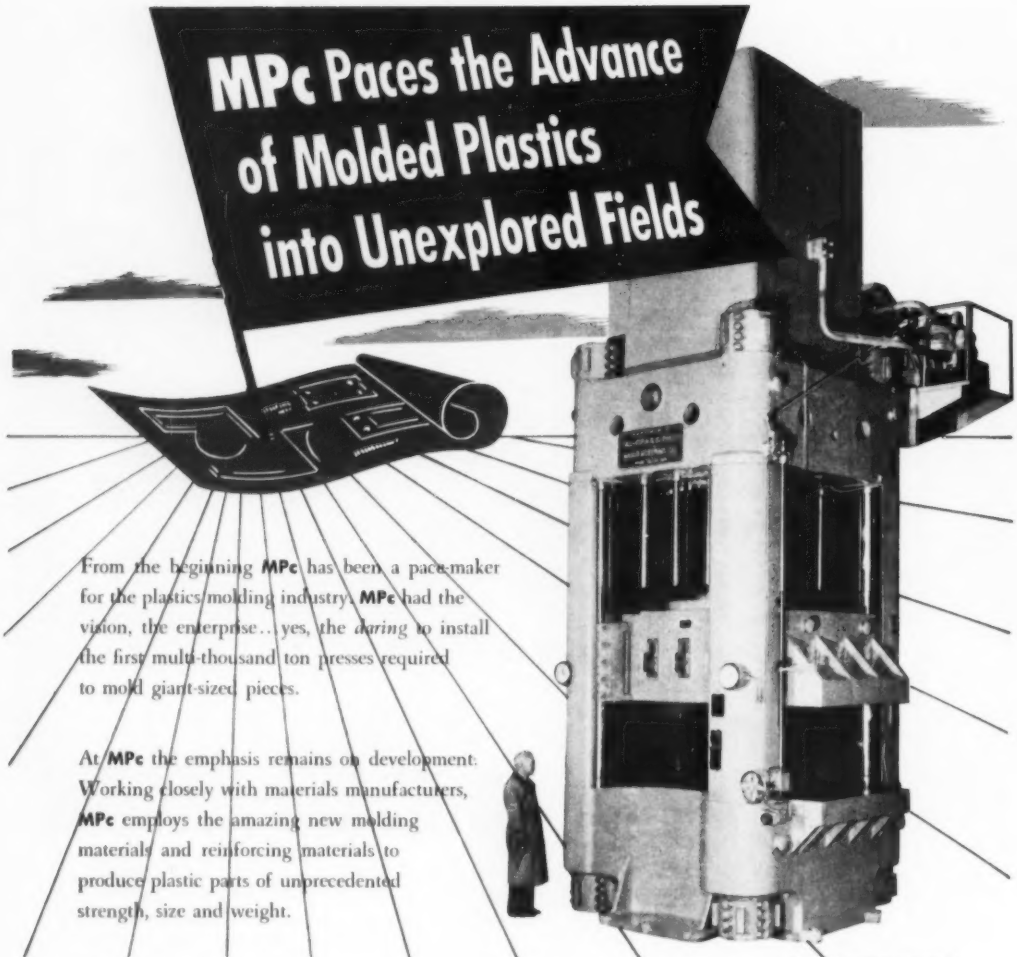
**Trademark Registered*

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Nylon, Plexiglas, Polystyrene, Styron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Corex, Forticel, [redacted]*, Saran, and other Thermoplastic Materials.

2930 NORTH ASHLAND AVENUE • CHICAGO 13, ILLINOIS

MPc Paces the Advance of Molded Plastics into Unexplored Fields



From the beginning **MPc** has been a pace-maker for the plastics molding industry. **MPc** had the vision, the enterprise... yes, the *daring* to install the first multi-thousand ton presses required to mold giant-sized pieces.

At **MPc** the emphasis remains on development. Working closely with materials manufacturers, **MPc** employs the amazing new molding materials and reinforcing materials to produce plastic parts of unprecedented strength, size and weight.

The challenge of the new or unusual is met at **MPc** with inventive engineering skill...supported by unmatched molding and tool-room facilities. Product design engineers with big ideas are invited to consult with MOLDED PRODUCTS CORPORATION, 4335 W. Harrison St., Chicago 24, Illinois.

Molding presses with capacity from 50 to 3000 tons

The MPc tool-room has produced the largest molds made in this country...

...and some of the smallest and most intricate molds

MOLDED MPc PRODUCTS

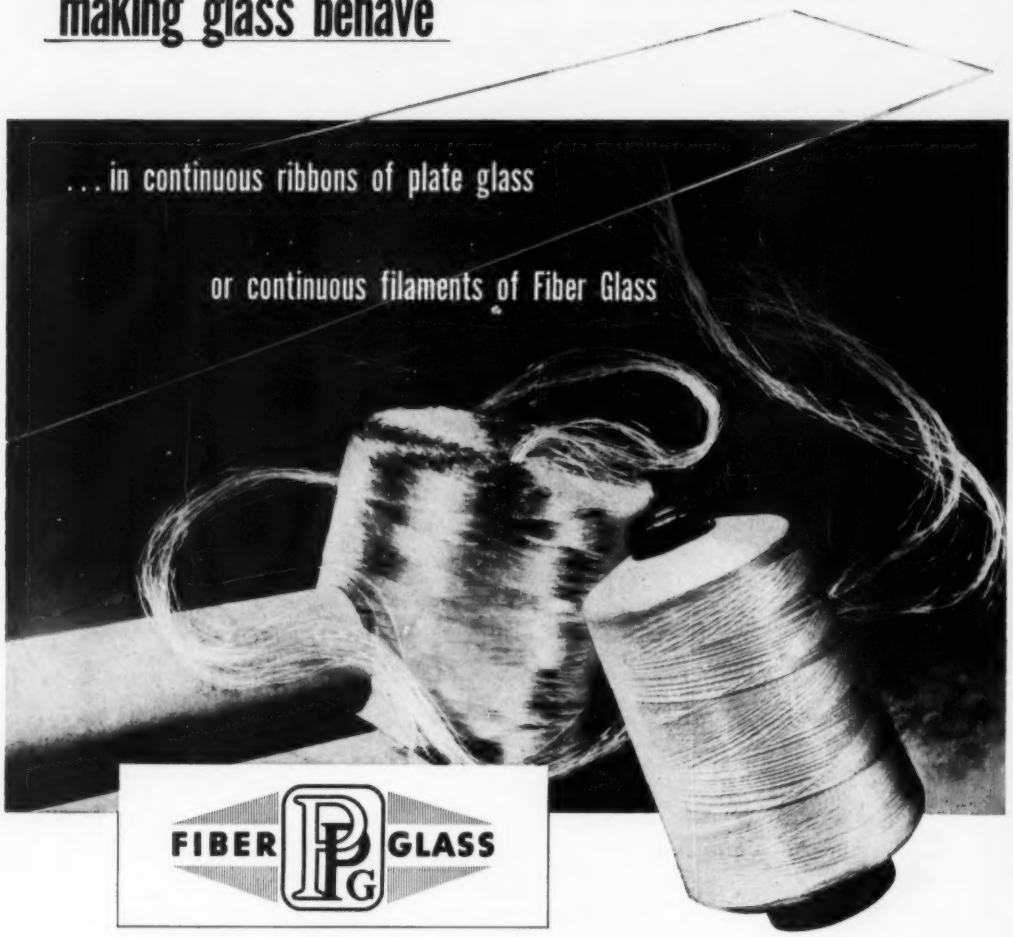
DIVISION OF ADMIRAL DISTRIBUTORS, INC.

...Pace-Makers in Plastics Molding

MEMBER: COMMITTEE ON LARGE PLASTIC MOLDINGS OF THE SPI

FREE "Data Book of MPc Facilities," an engineering-eye view of MPc press capacities and other production facilities...together with a survey of MPc special skills available for your use. Write for your copy.

making glass behave



Extremes in utility, extremes in form—and excellent illustrations of the skills acquired by Pittsburgh Plate Glass Company in 70 years of glassmaking.

PPG makes glass behave . . . drawing it into the tiny continuous filaments of gossamer fineness for Fiber Glass just as skillfully as it rolls it into continuous ribbons of plate glass. From raw materials, through all the intricacies of manufacture, PPG Fiber Glass is made to meet the most exacting needs.

If Fiber Glass is used in your products—or if you contemplate its use to replace other materials—investigate the many advantages provided by PPG facilities. Pittsburgh Plate Glass Company, 420 Duquesne Way, Pittsburgh 22, Pa.

You can obtain PPG Fiber Glass in these forms

Superfine Insulation—Extremely light-weight, efficient thermal/acoustical insulation for aircraft, automobiles, household appliances, cold-weather garments, etc. Available with foil and vinyl facings as well as un-faced.

Yarns, Strands and Roving—For industrial and decorative textiles; reinforcement of plastics, paper and rubber; electrical insulations.

PPG field engineers are available to work with you on any applications involving the use of these Fiber Glass products.

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PITTSBURGH PLATE GLASS COMPANY

Emenee

Coty

WE WILL MÉTALIZE YOUR PLASTICS

At lower cost than is possible in your plant!

Banner

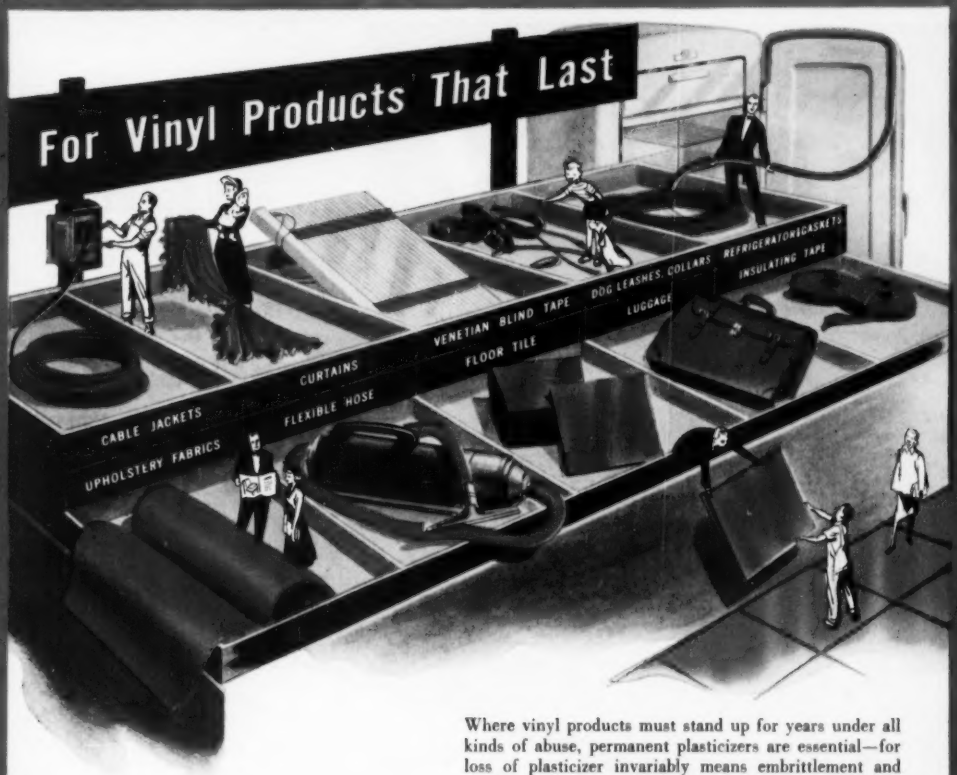
VACUUM METALIZING

CORPORATION

AMERICA'S LARGEST VACUUM PLATER

. . . our block-long plant of vacuum installations permits lowest prices.

LONG ISLAND CITY, NEW YORK



Where vinyl products must stand up for years under all kinds of abuse, permanent plasticizers are essential—for loss of plasticizer invariably means embrittlement and service failure. Choose one of these PARAPLEX plasticizers, and you can expect uniform, high quality throughout the service life of your product:

PARAPLEX G-25 has long been recognized as the best plasticizer for all-around performance and long life. Non-volatile, non-migratory, highly resistant to extraction by water, oil, and gasoline.

PARAPLEX G-40 is a lower cost plasticizer, which has many of the properties of PARAPLEX G-25. It has better color, oil resistance, and resistance to migration into rubber.

PARAPLEX G-50 is the most economical of the permanent plasticizers, representing an excellent compromise between quality and cost. It is easy to handle, and is an excellent pigment grinding medium.

PARAPLEX G-53 is a new plasticizer which combines moderate price with low extractability by either oil or soap and water.

PARAPLEX G-25

PARAPLEX G-40

PARAPLEX G-50

PARAPLEX G-53

Permanent Plasticizers

To learn which plasticizer best fits your vinyl needs, write for our plasticizer manual, Dept. FF-1.

PARAPLEX is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

THE RESINOUS PRODUCTS DIVISION

Washington Square, Philadelphia 5, Pa.

Representatives in principal foreign countries

THE DOWDING

AUTOMATIC *FAST-CYCLING*

INJECTION MOULDING MACHINE

- Fully automatic and foolproof
- Fast plasticizing at unusually low injection presssure
- 3 zone cylinder heating
- Vickers hydraulic equipment
- Automatic lubrication
- Made in England
- Built to American screw thread standards
- Early delivery

SPECIFICATIONS

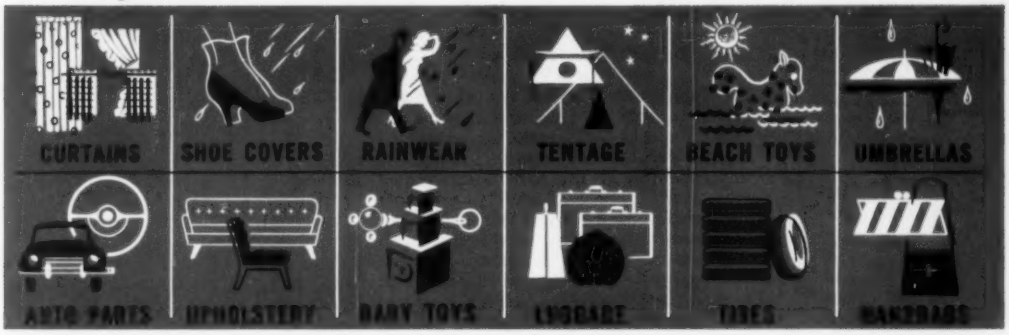
Cycles per hour (maximum)	1200
Material plasticized per hour (dependent upon shot size and material)	22 lb.
Area of injection plunger	2.074 sq. in.
Pressure on material at end of plunger	9100 lb./sq. in.
Total pressure on injection plunger	18850 lb.
Mould opens (adjustable)	6-8½ in.
Maximum die space	6¾ in.
Minimum die space	2¾ in.
Maximum recommended casting area in mould	15 sq. in.
Size of die plates	16 x 10 in.

DOWDING & DOLL LTD
CABLES ACCURATOOL, LONDON
GREYCOAT STREET, LONDON, S.W.1

Drew produces a choice of Plasticizers for use in manufacturing a wide range of products requiring toughness, permanence and flexibility under extreme heat and cold. Outstanding among these Drew quality products is PLASTICIZER SC.

SC Offers extreme flexibility under extreme heat or cold, and assures reliability and permanence in the finished product. SC promotes wetting and dispersion of filler in production. Exceptionally stable and resistant to oxidation and rancidity, it is widely used in Vinyl Resins for high plasticizing action down to temperatures as low as —70°F.

Recommended for a wide variety of applications, including embossed surfaces, fabric coatings such as raincoats, tenting, car covers; shoe soles, wire and cable insulation, medical tubing, etc. SC is easily emulsified, and can be conveniently added to aqueous dispersion of synthetic resins and rubbers.



OTHER DREW PLASTICIZERS OFFER OUTSTANDING PROPERTIES

DP 200

An excellent all-purpose plasticizer with exceptionally low heat loss and low "sweat-out". Provides plastic action down to –50°F. DP 200 gives low brittle points to vinyl chloride plastics. Low viscosity—ideal as softener for synthetic rubber manufacturing.

DP 250

A light colored, low viscosity polymeric type plasticizer which retains the easy handling properties of lower weight monomeric types. Affords good low temperature flexibility, excellent resistance to heat and light aging. Very resistant to leaching action of oils. Produces good results as an aid in pigment wetting and grinding, extrusion and calendering.

DP 520

The protein plasticizer. Gives products flexibility, clearness, toughness, permanence and exceptional stability against humidity. Low susceptibility to heat or cold. Compatible with natural or synthetic resins. The plasticizer for casein, zein, soybean protein and synthetic rubber compounds. Ideal for making coatings, adhesives, impregnants, inks and other protein base products.

For complete details and technical data on all Drew Plasticizers, call or write

DREW PRODUCTS

TECHNICAL PRODUCTS DIVISION

E. F. DREW & CO., Inc.

15 EAST 26th STREET, NEW YORK 10, N.Y.

BOSTON • PHILADELPHIA • CHICAGO

Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

Argentine Patent 74,095 dated Dec. 14th, 1949 on invention covered by U. S. Patent 2,487,400 November 8, 1949. Canada Patent 463,387 Feb. 28th, 1950. Union of So. Africa Pat. 8,592 Sept. 21st, 1949. Belgium Pat. 491,293 Oct. 15th, 1949. Switzerland Patent 48,970 Sept. 23rd, 1949. Italy Patent 456,937 September 19th, 1949. Germany Patent 829,248 September 25th, 1949. Great Britain Patent 96,970 September 27th, 1949. Argentina Patent 39,676 December 29th, 1951. 30th, 1949. Brazil Patent 51,615 January 3rd, 1952. Other U. S. and Mexico Patent Foreign Patents Pending.

TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.

TUPPER /

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

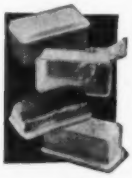
Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

TUPPER CORPORATION

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Por Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.



The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.

When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

TUPPER CORPORATION

Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

Factories, Laboratories and Sales Offices: Farnumsville, Mass., Orlando, Fla., L'Epiphanie, P.Q. Showrooms: 225 Fifth Ave., N. Y. C.

ADDRESS ALL COMMUNICATIONS TO: Department M-5

That reason is the Banbury* mixer—the machine you see in so many modern, up-to-the-minute processing layouts. And the reason why you see the Banbury so often is because its design has never been allowed to grow old.

Methods of installing Banbury mixers have been developed which make it possible practically to eliminate the manual handling of stock to and from auxiliary equipment. Improvements in operating techniques and in the design of the machine itself have made the production of successive batches more and more uniform. With the addition of control equipment, such as a timing device, temperature recorder and discharge mechanism, each operation in the mixing procedure can be accurately controlled and an even flow of production assured.

The complete story of the latest Banbury developments is contained in a 32-page publication, "BANBURY MIXERS," Bulletin 189. Send for a copy today — no cost or obligation.

FARREL-BIRMINGHAM COMPANY, INC. • ANSONIA, CONN.
Plants: Ansonia and Derby, Conn., Buffalo, N. Y. • Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

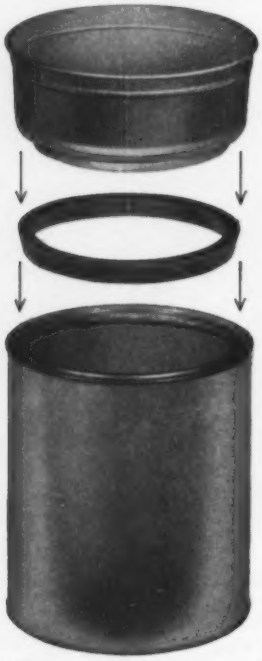
Farrel-Birmingham®

BANBURY MIXERS ARE USED FOR THE FOLLOWING PRODUCTS: Automotive Tires and Tubes • Rubber Shoes • Rubber Soles and Heels • Mechanical Rubber Goods • Foam or Sponge Rubber • Insulated Wire • Rubberized Cloth Druggists' Sundries • Hard Rubber Articles • Battery Cases, Rubber and Asphalt • Asphaltic Materials • Asphalt Tile • Rubber Tile • Devulcanizing and Reclaiming • Gutta Percha • Floor Coverings • Matting • Linoleum • Roofing Material • Sound Records • Resinous Compounds • Phenolic Condensation Products • Pyroxylin Plastics • Vinyl Chloride Plastics • Plastic Film • Cellulose Materials • Paints, Enamels, Varnishes, Lacquers • and many other compounds.

*Trade-mark

FB-689

Another new development using AMERICAN ANODE *materials*



Topper made by Fostoria Pressed Steel Corp., Fostoria, O. American Anode supplies the plastisol for the seal only.

Casting plastisol in molds.

Showing infra-red ovens that fuse plastisol, and finished seals.

PAINTERS' DELIGHT!

Leakproof-sealed topper ends splash and mess

IF you've ever mixed colors in a paint can and poured the mixture into a smaller can or roller pan, you know what happens! Here's an ingenious device for painters that helps avoid splashing.

It's a steel topper that fits snugly on standard paint cans. It's easily removable, can be used over and over, gives painters a new working tool.

Important part of this topper is the flexible seal made of American Anode plastisol that forms a leakproof connection between the can and the topper. Result—no leakage when the can is tilted.

And this plastisol seal resists the effects of paint and of constant usage, will last a long time.

It's typical of the many successful products made with American Anode plastisols. For these versatile materials can be coated, cast, dipped or molded. They can be made resistant to heat and cold, abrasion, grease, oil, and many chemicals.

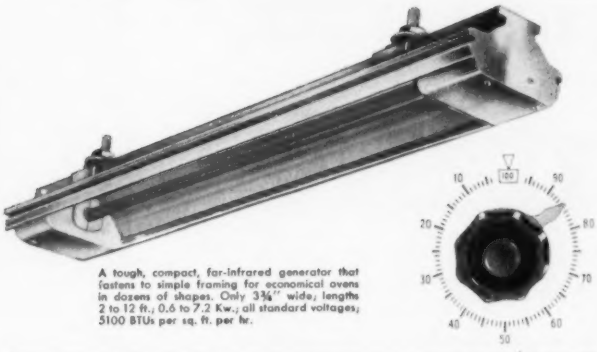
Perhaps American Anode plastisols, or other materials, can help you improve or develop more saleable products. Our wide experience and helpful service are ready to work for you. For information, please write Dept. AD-3, American Anode, 60 Cherry Street, Akron, Ohio.

AMERICAN ANODE

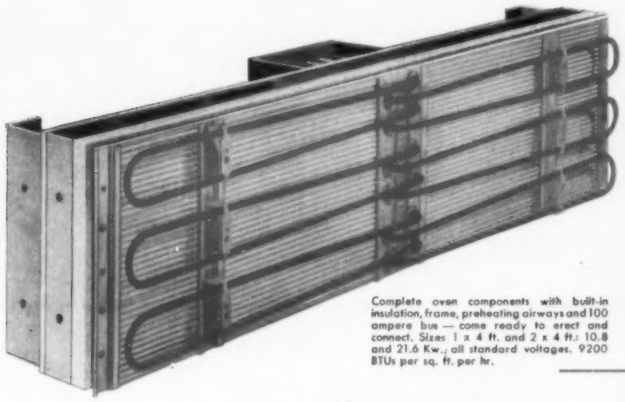
A Division of The B. F. Goodrich Company

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS, AMERAN RESIN PASTES, COMPLETE MANUFACTURING FACILITIES

uniform heat . . .
precise heat . . .
fast heat . . .
"**color blind**" heat . . .



A tough, compact, far-infrared generator that fastens to simple framing for economical ovens in dozens of shapes. Only 3¾" wide; lengths 2 to 12 ft.; 0.6 to 7.2 Kw.; all standard voltages; 5100 BTUs per sq. ft. per hr.



Complete oven components with built-in insulation, frame, preheating airways and 100 ampere bus — come ready to erect and connect. Sizes 1 x 4 ft. and 2 x 4 ft.; 10.8 and 21.6 Kw.; all standard voltages. 9200 BTUs per sq. ft. per hr.

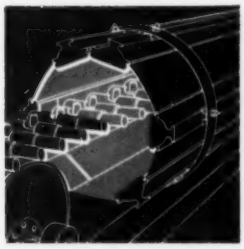
A Chromalox Electric Radiant Panel or Chromalox Radiant Heater installation gives you a quick, low-cost answer to your baking, curing, drying and other heating needs. Pre-engineered units allow on-the-spot erection and connection. You get up to 700° F. work temperatures; absolutely uniform radiation with no hot and cold spots; high intensity heat that's absorbed *f-a-s-t* by all colors; and accurate "dialed" heat from 0 to 100% of capacity.

CHROMALOX *Electric*

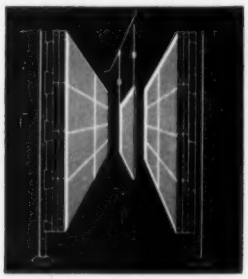
Far-infrared Units

TWO JOB-PROVED FAR-INFRARED TYPES TO CHOOSE FROM!

You'll find Chromalox pre-built Radiant Panels and Heaters from stock fit your jobs and your budget. Shown below are just two of the literally hundreds of oven shapes and sizes which can be erected quickly and easily using Chromalox Electric Radiant Units.



Conveyorized oven built on the job using Chromalox Radiant Heaters. Units are installed in lengths and ratings needed to fit the work. Input controller gives precise and exact temperatures easily adjusted to meet varied processing requirements. Easy to assemble, easy to wire.



Chromalox pre-engineered Radiant Panels are easily and quickly erected and connected to form ovens and drying tunnels of any size and shape. An oven such as sketched may be installed in 20 to 30 man-hours with minimum engineering expense and lowest cost per installed kilowatt.

Have a Problem Involving Degreasing, Drying, Baking, Preheating, Curing?

The assistance of Chromalox Application Engineers is yours for the asking. They'll help you work out your specific requirements without obligation. Write today.

EDWIN L. WIEGAND CO. IC-70
7503 Thomas Blvd., Pittsburgh 8, Pa.

I'm interested in electric heat for.....

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☐ Send me Bulletins on Far-infrared units.
☐ Have a Chromalox Application Engineer get in touch with me.

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City.....Zone.....
State.....

more MANUFACTURERS

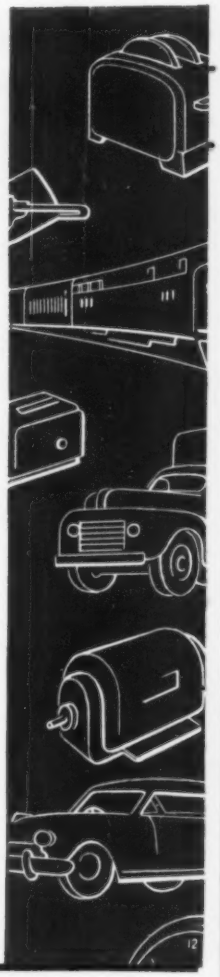
OF AMERICA'S BEST KNOWN PRODUCTS

USE more

The Original

PARKER-KALON® SELF-TAPPING SCREWS

THAN ANY OTHER TAPPING SCREW



. . . . BECAUSE WITH P-K,

PLANNED SAVINGS PAY OFF

Be sure you get P-K STANDARDS in POINTS

P-K point design makes sure the screw starts right, drives right. For example, by specifying P-K you can be sure of well formed, sharp gimlet points on Type A. With sharp point, P-K Type A stays upright, even when holes are misaligned—doesn't tip like a blunt point screw. It takes an extra operation, costs more to make the right kind of gimlet point, but P-K does it to give you fast, trouble-free assembly.

ORDER from the local P-K DISTRIBUTOR . . .

the SUPPLY SPECIALIST that serves you.

WELL PLANNED IS HALF DONE

. . . but only half done, when you plan assembly. For screw failure can cancel all planned savings. That's why, to *insure* savings, so many fastening-wise manufacturers insist on Parker-Kalon Self-tapping Screws.

Since assembly expense is a sizable percentage of total production costs (in some products as much as 75%), they know fastening operations are a prime target for cost reduction.

Keep your assembly line trouble-free. Avoid screw failure, parts spoilage, high reclamation costs. Specify P-K Self-tapping Screws, and be *sure* planned savings pay off.

Remember

IF IT'S P-K IT'S O.K.

PARKER-KALON®

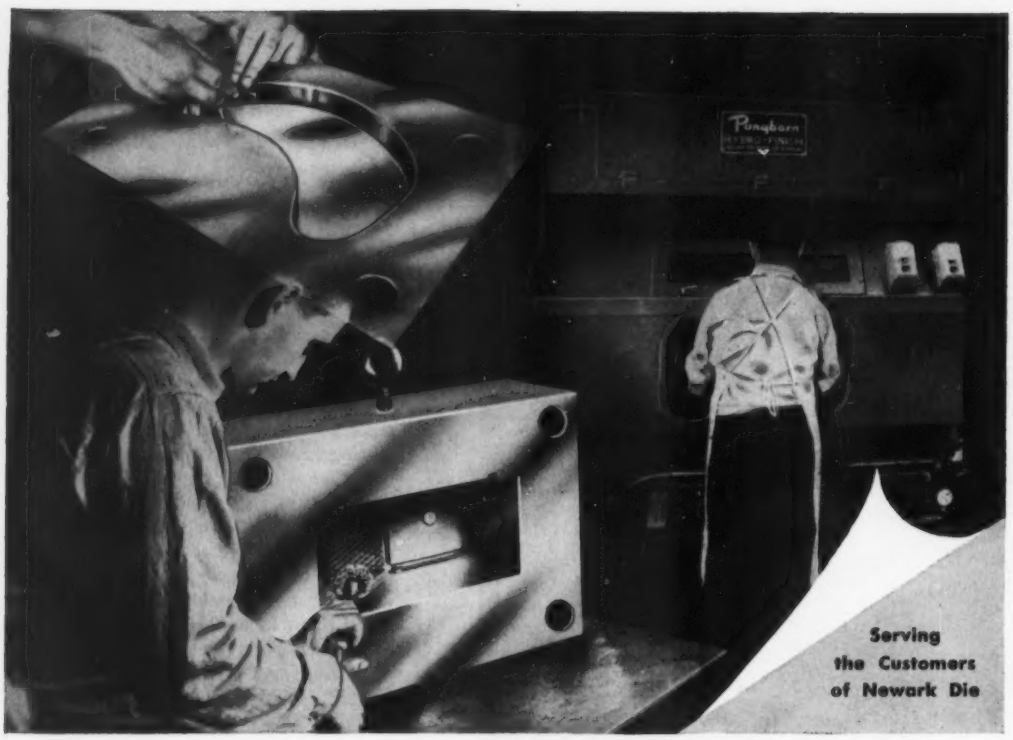
SELF-TAPPING SCREWS

Be sure you get P-K STANDARDS in HEADS

Heads on P-K Screws are all full formed to exacting P-K Standards, concentric with shank. Slots are cleaned sawed—free from burrs—not too deep to weaken head, not too shallow or narrow to prevent proper seating of driver. You have to look close to see this detail, but the difference it makes on the assembly line shows up quickly. By specifying P-K you can be *sure* of uniform, trouble-free head design in every screw.

NEW BOOKLET NOW READY

A handy guide to lower costs in assembly, filled with facts you need to start making savings you are missing. Ask your P-K Distributor, or write for Form 475-D. Parker-Kalon Corporation, 200 Varick St., N. Y. 14.



A high polish on MOLDS MEANS

BETTER PRODUCTION, BETTER FINISH . . . ON MOLDED PARTS

Producing the fine mold finish required by molders of plastic parts calls for the use of the finest quality of abrasives. And it calls, *too*, for the *application* of these abrasives by the method best adapted to the requirements of a specific mold.

Here at Newark Die, naturally, only the highest-quality abrasives are used. Skilled hand-craftsmen apply them by such processes as hand grinding and stoning. The newest types of machines are also utilized—to finish molds by liquid honing.

It is the combination of all three—fine abrasives, trained hands, new machines, *plus* the application of the latest techniques—that results in turning out the highly polished molds that serve exacting requirements of the customers of Newark Die.

NEWARK DIE COMPANY

22 SCOTT STREET, NEWARK 2, N. J.

Phone: MArket 2-3305

NDCo TRADE MARK

Hettrick table and chairs are outstanding uses of molded polyester resins and Fiber·Glass

Lynn Scott, nationally known home stylist and Director of Plaskon Home Arts Council, says, "This Hettrick table and chair set will grace any room. It has the permanent beauty of molded-in color with easy-to-clean, smooth contours. Lightweight and weather resistance make it ideally suited to indoor and outdoor living."

Designed by
J. M. Little & Associates

Molded by
Molded Fiberglass Co.

Manufactured by
The Hettrick Manufacturing Co.

The Hettrick chairs and table shown above point the way to exciting possibilities in design and material properties which you can put into your product whenever you mold with Plaskon Polyester Resins and Fiber·Glass.

Consider how *your* product will stand to benefit. Moldings that excel in strength, lightness, and durability can be achieved with Plaskon Polyester Resins and Fiber·Glass. Dimensional stability, flexural strength and resistance to common solvents and weathering are exceptional.

In addition, Plaskon offers Fiber·Glass roving with exclusive Garan-sizing which assures a higher degree of translucency and extra strength in the finished molding, through greater wettability.

For uniform quality of ingredients, as well as the benefits of Fiber·Glass roving with genuine Garan-sizing, check now with the one reliable *single source* for all materials . . . Plaskon. For information or technical assistance, write today to Plaskon Division, Libbey·Owens·Ford Glass Co., Dept 153, Toledo 6, O.

PLASKON DIVISION
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INSIST ON
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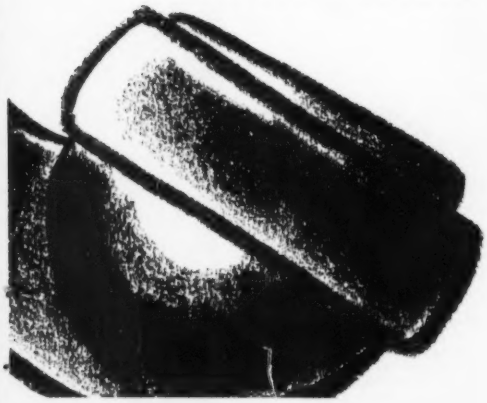
POLYESTER • FIBER·GLASS
FOR REINFORCED PLASTICS

..... and let's decide how much advertising space we'll need in the '53 edition of MODERN PLASTICS ENCYCLOPEDIA... Yes, they're accepting space reservations for the new book now.

Circulation?...the same as MODERN PLASTICS magazine. Publishing date is set for September.

If you don't have all the facts we'll need, write to the Advertising Department of Breskin Publications. Their address is 575 Madison Avenue, New York City 22.



Do it now!

Hounded by high production costs?

Molded plastics bring high costs to bay. Their unlimited color range, smooth finish and adaptability to design offer many production economies. Molded plastic parts cut finishing and fabricating costs . . . eliminate many production steps entirely.

free AICO plastics applicator picks the *right* plastic for your product

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MODERN PLASTICS

MAY 1953 VOL. 30, NO. 9

TAPES ARE STUCK ON PLASTICS

IN PLASTICS lies the future of the tape industry. Progressive thinking leaders in the tape field predict an ever-expanding market for pressure-sensitive tapes; they also point to plastics as playing a major part in their past, present, and future growth. More important, these same leaders forecast an increasing emphasis on plastics within the industry itself as new materials are created and new applications are developed.

Unlike the comparatively calm days of some 50 years ago, when only a handful of companies were producing surgical adhesive dressings, the tape industry of today is a hectic, intensely competitive business. And every company with a stake in this business is utilizing the versatile properties and attractive appearance of plastics to promote the acceptance of their products in a widening area of industrial and consumer applications.

Plastics and Tape

In preparing this survey, a study was made of the impact of plastics materials on each of the four different types of adhesive tapes (see box, this page). Whether as a synthetic resin in the adhesive, as a low-melt coating, or as a pure film backing, plastics are involved in the development of each.

The decision to limit this survey to a study of pressure-sensitive tapes was based on the more important relationship existing between the use of plastics and the growth of this

Courtesy Industrial Tape Corp.

Contributing to expanding usage of corrosion-resistant plastics tapes as a stable protective barrier for underground or overhead pipe lines is ease of application by hand

Categories and Classifications of Tapes

The only characteristic common to th[illegible]amily of "tapes" is shape —a narrow band or strip. Beyond that, de[illegible] of tape can become as complicated and as varied as the endl[illegible]aber of tapes that are available as standard products or on special order.

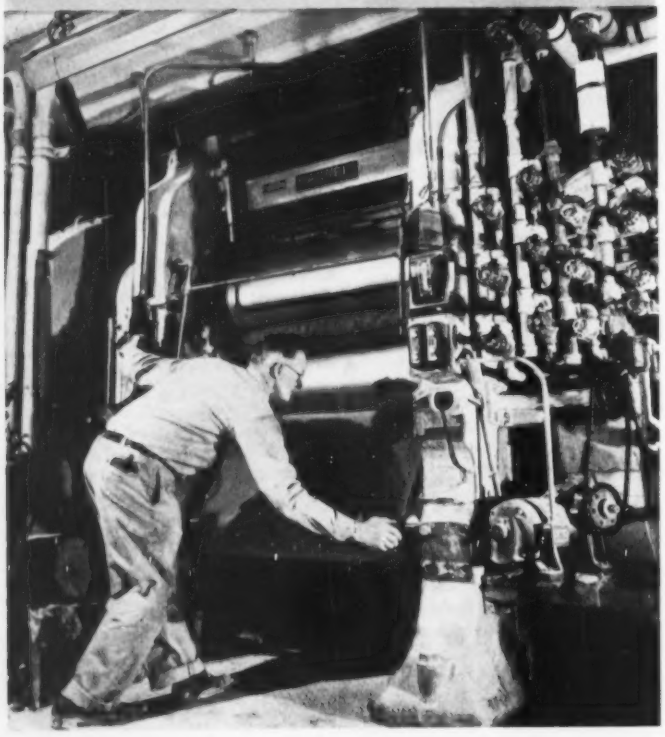
Tapes are generally divided into two categories: non-adhesive (e.g. steel tape) and adhesive. The latter category is sub-divided into four classifications, determined by the type of adhesive that is applied: a) Solvent-sensitive—activated by addition of a solvent (e.g. gummed tape); b) Thermoplastic—adheres under the application of heat (e.g. mending tape); c) Cohesive—effects firm, permanent bond to its own backing when wound upon itself (e.g. friction tape); d) Pressure-sensitive—adheres under pressure to almost any surface (e.g. surgical tape).

The largest classification in terms of sales volume and the one for which the greatest quantity of plastics are being earmarked is the pressure-sensitive tape industry. To clarify for the readers of MODERN PLASTICS the part that plastics will play in the continuing development of the pressure-sensitive tapes, two articles surveying the entire field have been prepared. The first article, starting on this page, deals with plastics as backings, either alone or laminated to paper, and in the adhesives for pressure-sensitive tapes; the second article will concern itself with reinforced tapes and the use of plastics coatings on cloth and paper-backed tapes.

Photos courtesy Hampton Mfg. Co.

In preparation of adhesive for tape, mass compounded of ground rubber, resin, fillers, and stabilizers, is spaded off heated rolls and packed into pans to be cooled and aged

In calendering method of placing adhesive on tape backing, three horizontal steel rollers knead the mass and then apply it under pressure onto the unwinding thin film



particular segment of the industry. Specifically, three reasons governed the choice.

(1) The use of plastics, both as a backing material and as a coating for paper and cloth, has been a principal factor in the acceptance of pressure-sensitive tape as an important industrial tool.

While no exact figures are available from the tight-lipped industry, one estimate places today's sales of tapes at a figure almost 50 times that of 1939—the year that experimentation began on the use of plastics materials.

As flexible, stretchable, and easily conformable materials, plastics have acquired popularity in innumerable industrial tape applications; as a primary insulator with excellent electrical properties, plastics have opened an entirely new and lucrative field for pressure-sensitive tapes in the electrical and electronic industries; as a smooth, attractive, moisture-resistant backing and coating, plastics have energetically begun to pry the lid from the relatively untapped consumer field; and as a strong, abrasion-resistant, and colorful packaging tape, plastics continue to fill the tremendous demand both from industry and Government.

(2) The variety of plastics that are going into the manufacture of pressure-sensitive tapes, coupled with large sales volume, makes the industry an important market for plastics of all types.

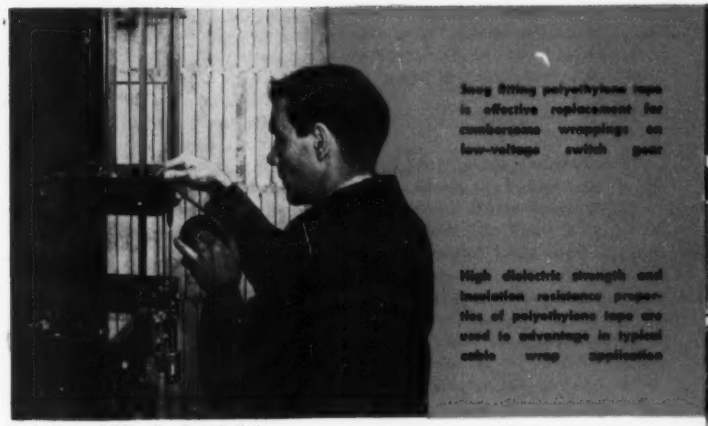
Vinyl, polyethylene, acetate, saran, and polyester films are used as the backing material for tape; vinyl, polyethylene, nitrocellulose, urea-alkyd, acrylic, and acetate are used for coating the paper and the cloth backings.

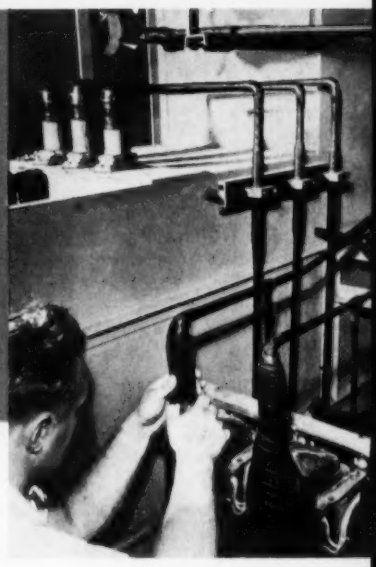
(3) Research is the watchword of the industry and plastics are the keystone on which the entire development program is being built.

With every manufacturing plant in the country and every consumer who has ever bandaged a finger as potential customers, the pressure-sensitive tape manufacturers are confident that a tape can be created to meet almost any need, and that plastics are the means by which the feat will be accomplished.

Adhesives

In developing a pressure-sensitive tape for a specific purpose, the choice of the adhesive formulation is as im-





Photos courtesy Polyken Div., Bauer & Black

portant in shaping required characteristics as are the backings or coatings.

More than 600 formulations are available, each of which is compounded with different quantities and types of elastomer and resin—the two basic ingredients of an adhesive mass.

The elastomers, which determine the strength and elasticity of the mass, include reclaimed rubber, natural rubber, or synthetic rubbers such as GRS or neoprene.

Tackifying resins, which contribute tack and adhesion to the mass, may either be natural or synthetic. The trend in recent years in formulating the adhesive has been to place increasing emphasis on the use of synthetics which, ranging from polyvinyl acetate and polyisobutylene to coumarone-indene and acrylic, have proved themselves more adaptable than natural resins. Temperature resistance, permanence of adhesion, moisture vapor transmission rates, and ease of application to the backing are controlled to a large extent by the many varieties of available synthetic resins.

At the same time, research in resins is opening the possibilities for newer, more versatile properties. The more recent experimental work has been on the vinyl ethers, which are claimed to offer superior aging characteristics and resistance to oxidation and ultra-violet light.

Preparing the Adhesive

The first step in compounding the adhesive mass for a tape is to grind the elastomer between heavy rollers at high temperatures. During the grinding process, measured quantities of the resins, modifying plasticizers, fillers, stabilizers, and pigments are added. The fillers alter the flow characteristics of the adhesive mass and the stabilizers serve the function of improving the aging of the rubber.

The mass is then fed between two side-by-side horizontal heated rolls. Additional chemical agents are added during the mixing until the mass adheres to one of the rolls as a soft, sticky adhesive.

A workman who is equipped with a spade-shaped tool scrapes the mass off the roller and packs it in pans to be cooled and then aged for a specified period.

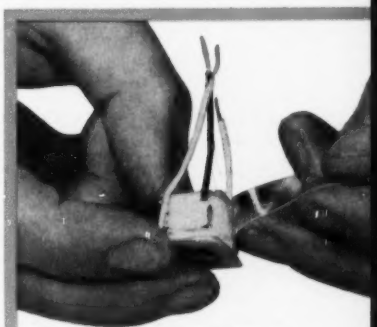
Manufacturing Process

The adhesive mass can be applied to plastics film by either calendering or solvent spreading. Calendering is used for tough, strong backings; solvent spread for more fragile backings that cannot take the pressure of calendering. Calendered masses have greater adhesion than solvent spread; the latter, however, have the advantage of possessing a higher degree of tack.

In calendering, three horizontal steel rolls are used, placed one on top of the other. The adhesive mass is fed between the top two heated rollers. A temperature difference causes the adhesive mass to adhere to the middle roller. At the same time, the backing is fed between the middle roller and the bottom roller. When the backing and the adhesive meet, the mass is pressed onto the backing at a pressure of about 10 tons.

The finished tape is then wound as it comes from the rolls and slit to pre-determined widths.

To manufacture a tape by solvent spreading, the mass is first mixed with measured quantities of solvent until it becomes a syrupy liquid. This liquid is then pumped into a tank from which it runs into a trough where it is knife-spread over the backing. After the spreading operation, the tape passes into a drying oven where dry, heated air evaporates the solvent. It is then wound



Courtesy Minnesota Mining & Mfg. Co.

Thin-gage, transparent polyester tape anchors and insulates soldered connections

and transferred to an air conditioned room where it undergoes slitting operations.

Variety

The different backings, coatings, adhesives, and methods of application that can be combined into one tape make possible a staggering variety of pressure-sensitive tapes.

Three of the country's largest tape manufacturers—Polyken Industrial Tape, Dept. of Bauer & Black, Chicago, Ill.; Industrial Tape Corp., New Brunswick, N. J.; and Minnesota Mining & Mfg. Co., St. Paul, Minn.—have had on the market at one time or another from 200 to 300 different types of tape.

Within the many categories of plastics backings, with which this article deals, there are, however, certain general traits and characteristics common to each family of tapes.

VINYL

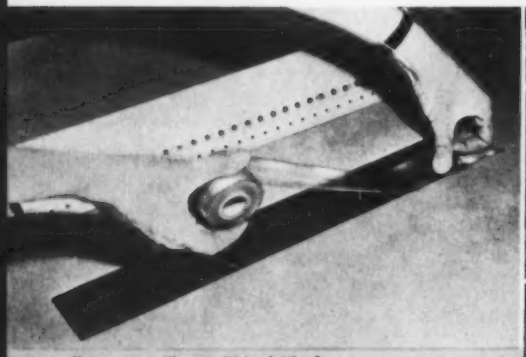
In volume of usage, vinyl is the most important of the plastics backings. The excellent electrical characteristics of vinyl makes the vinyl-backed tapes ideal primary insulators. On the basis of high dielectric strength—approximately 1000 v./mil of thickness—coupled with thin caliper, the tapes meet military specification MIL-1-7798 for wire splicing, cable splicing, and general insulating applications.

The vinyl tapes are resistant to acids, alkalies, corrosive salts, water, and greases; they provide excellent protection against weather; and they have high abrasion resistance.

When used as a protective wrapping for tools or sporting goods, for example, the vinyl tapes will not pick up oil, dust, or dirt.

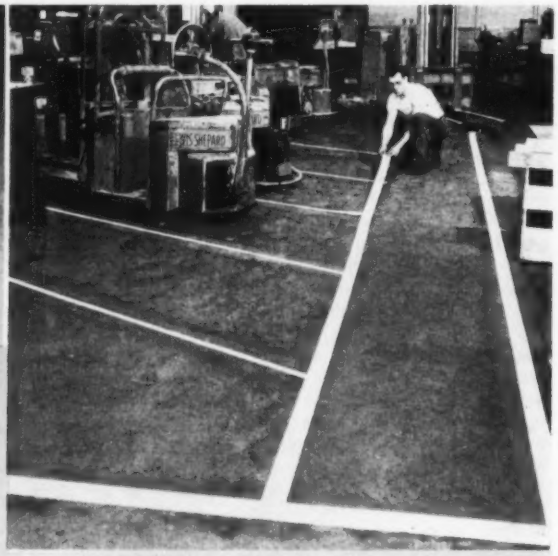
One particular advantage of vinyl tape is its ability to be stretched from 150 to 200% of its original length before breaking. The tape can thus be pulled down tightly to conform to irregular surfaces.

These tapes are available in thicknesses from 3 mil up to 20 mil. Tensile strengths vary with the thickness. A 7 mil tape, for instance, has a tensile strength of 20 lb. per in. of width; a 20 mil tape, 40 lb. per inch.

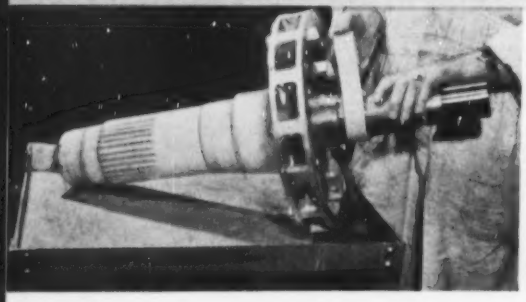


Photos courtesy Minnesota Mining & Mfg. Co.

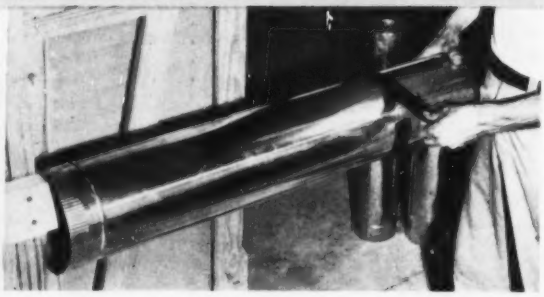
Vinyl tape prevents galvanic corrosion when placed between aluminum and magnesium parts for aircraft



Easy-to-apply plastic tapes for marking off lanes and aisles will outlast conventional materials



Solvent-resistant vinyl acetate-vinyl chloride tape is wrapped around parts to be protected during electroplating process



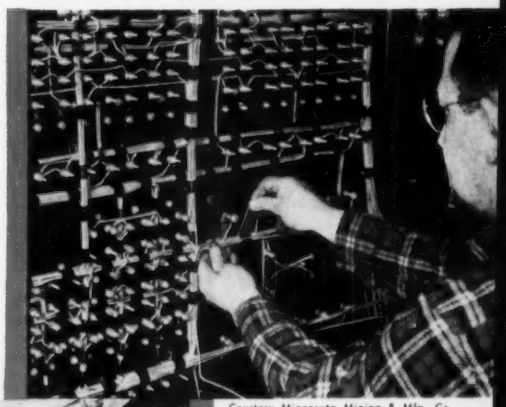
Recently developed tape application—sealing and joining air and heating ducts—reduces four steps formerly needed for job to a single step

A non-migrating type of plasticizer is used in compounding the vinyl film so that it will not attack the adhesive.

Companies manufacturing vinyl-backed tapes include: Minnesota Mining & Mfg. Co.; Industrial Tape Corp.; Van Cleef Bros., Inc., Div. Johns-Manville, Chicago, Ill.; Technical Tape Corp., New York, N. Y.; Ideal Industries, Inc., Sycamore, Ill.; and U. S. Rubber Co., New York, N. Y.

Minnesota Mining & Mfg. Co. also makes a series of tapes with vinyl acetate-vinyl chloride copolymer backings. The thinner tapes in this series are used as separators for dissimilar metals in the structural fabrication of aircraft and, when pigmented, as a means of marking traffic lanes in factories and the like. The thicker tapes are used for keeping wires, rods, and tubes in position. One specific application developed for the 10- and 20-mil tape is protective pipe wrap.

Johns-Manville, New York, N. Y., also has a polyvinyl chloride-acetate tape. Called Trantex, and available in both 10- and 20-mils thickness, the tape is similarly used as a pipe wrap for protecting underground and overhead pipe from corrosion.



Vinyl tape, used for harness wrapping, displays high dielectric strength, conformability, resistance to abrasion, and resistance to fungus

Courtesy Minnesota Mining & Mfg. Co.

Principal application for vinyl as well as polyethylene tape, is splicing electrical wire. Tapes are more easily applied, less bulky, and more practical than the conventional rubber and friction tapes

Courtesy Industrial Tape Corp.

Surgical Tapes

Although surgical tape is the grand-daddy of the pressure-sensitive industry, it has only been recently that the use of a cast vinyl film backing began to make its impact on the field.

Faced with the problem of finding both the proper plasticizer and adhesive formulation that would remain compatible when subjected to sterilizing heat and germicidal agents, it was only two years ago that the tapes first appeared on the market.

By the end of 1951 Bauer & Black and Johnson & Johnson, New Brunswick, N. J., the largest manufacturers of vinyl surgical tapes, began intensive promotion to educate the public as to the benefits of replacing the traditional cotton backing with vinyl film. Already this advertising program has cost both companies some $2½ million—almost 5 times as much as has ever been spent on the fabric type of surgical tape.

Although the poundage of vinyl used is small in comparison to the total volume of resin produced, the new tape remains a glamorous and spectacular project upon which the producers have hung a dynamic campaign, with emphasis on the part that plastics are playing in bringing better products into close contact with more people.

The flexible vinyl surgical tapes conform closely to the contour of the skin yet allow complete freedom of movement. They are water-proof, soil-resistant, can easily be cleaned with soap and water, and are attractively flesh colored.

The first approach to the use of plastics in the field of surgical tape products was the conception and development of a surgical drape to meet the serious hygienic needs which arose in field hospitals during World War II. The surgical drape, manufactured by Minnesota Mining & Mfg. Co., is made of thin vinyl film edged with a pressure-sensitive adhesive. In a surgical operation, the drape is adhered to the body as a protective measure for the area surrounding an operation. Formerly, metal clips or sewing of towels were necessary.

POLYETHYLENE

Calendered, oriented polyethylene as a backing for tape is a development of Polyken Div., Bauer & Black.

The only other polyethylene film backing being used thus far is a product of Minnesota Mining & Mfg. Co. This is an extruded, transparent film inert to practically all common commercial solvents and is suited for sealing polyethylene containers.

In developing both tapes, the problem was to first formulate a suitable adhesive mass that would overcome the physical and chemical inertness of polyethylene and thus anchor the adhesive to the tape.

The calendered, oriented film tape

Courtesy Industrial Tape Corp.

Use of colored acetate fiber tape produces neat and attractive food packages

Courtesy Industrial Tape Corp.

On various types of shipping containers, plastics tapes provide strong seals

Courtesy Minnesota Mining & Mfg. Co.

Parts of complex fuel line system are easily identified by colored acetate fiber tapes

is reported to have better stretch and better tensile strength than extruded film. Bauer & Black lists the tensile strength for their 9 mil tape at 16 lb. per inch of width.

Although the elongation of polyethylene—100% of its own length before breaking—is not as high as that of vinyl, the elasticity of the calendered, oriented material is greater. When wrapped around pipe or wire, the polyethylene tape has a tendency to return to its original shape, thereby effecting a tight bind.

Electrical properties of the polyethylene tape are outstanding. Under A.S.T.M. D-149-44, dielectric strength for a 9 mil Bauer & Black tape is over 10,000 volts. The tape also has a low water-vapor transmission rate and resistance to solvents, chemicals, and fungus.

Polyethylene's melting point is lower than that of vinyl, but it generally has better flexibility at low temperatures.

Masking and spray-painting for letter-coloring are eliminated by pressing colored tape into the recessed letters during the stamping operation and stripping off excess tape

Courtesy Minnesota Mining & Mfg. Co.

Electrical Applications

The future for both vinyl and polyethylene tapes is tied up with the extent to which the use of the materials continues to expand in the electronic and electrical industries.

The largest volume application in these industries is in splicing, as a replacement for the standard rubber-plus-friction tape covering. While they cannot be used on all electrical connections, the plastics tapes have a definite superiority in many applications. Only about 20% of the electrical tapes sold today are plastics but the tape industry feels that as the advantages of the material become more widely known both to industry and to the ordinary household user, their popularity will increase. Already, the majority of manufacturers of rubber and friction tape are also marketing several of the vinyl tapes, of which about 20 types are currently available.

The new plastics tapes, with excellent dielectric strength as an integral part of the backing, eliminates the need for two tapes. In comparison to the double job of laying on the bulky rubber and friction tape, the thin plastic-backed pressure-sensitive tapes are easier to apply and make

possible a more compact insulating job.

Electrical applications in which the plastic-backed tapes have found successful use include cable insulation; harness winding; electrical repairs; insulation wrap on handles of electrician's tools; taping radio and TV antennas; as a stop-off in electroplating; and a host of other jobs where space limitations, excellent electrical properties, ease of application, and conformability are important requirements.

Corrosion Prevention

Corrosion of metal surfaces, which is estimated to cost industry some $8 billion yearly may be offset to a great extent by a newly developed application—protective plastics pipe-wrap tape. Thoroughly tested in the field, vinyl and polyethylene tapes have proved to be stable protective barriers for underground or overhead pipes.

Millions of miles of underground pipe lines that cross the country and millions of miles of overhead pipe in use in chemical plants or wherever else corrosive elements are prevalent, represent a potential volume market that may well out-strip all other tape applications. One company estimates that within the next two years some 31,000 miles of pipe line will have been protected with plastics tapes—and that's only the beginning.

To prepare pipe for taping, the surface is first thoroughly cleaned by wire brushing. The tape is then spirally wrapped either by hand or by a special wrapping machine developed by Johns-Manville and manufactured by A. E. Betzel Engineering Co., Arlington, Tex. When the pipes are installed underground, an asbestos felt wrapping is placed over the tape to protect it from the stone and dirt backfill. The ease of application greatly reduces the cost of corrosion prevention.

The protective tapes will resist fungus, solvents, sunlight, acids, and alcohols. They conform to irregular surfaces, bonding equally well to pipe or enamel coating, and have excellent aging properties, low moisture vapor transmission rate, and high dielectric strength.

Last July, 61 test installations were set up by one company in the major trouble points of a chemical plant dealing with corrosive materials; tapes completely out-performed painting or other coatings. After only two to three months, each of the paint jobs required repainting; the tape-covered pipes still show no sign of being in need of repair or replacement.

Johns-Manville, Industrial Tape, Minnesota Mining and Mfg., and Technical Tape Corp., are manufacturing vinyl tapes for this purpose; Bauer & Black, Polyken Div., is the manufacturer of the polyethylene tape.

ACETATE

Acetate film backings are perhaps the most versatile of the plastics

(*Continued on p. 181*)

Vinyl tape, as a protective pipe wrapping, is applied to an underground gas main running through highly corrosive soil

Courtesy Minnesota Mining & Mfg. Co.

Polyethylene tape can be wrapped on pipe by machine as well as by hand. Ease of application of plastics tapes greatly reduces the cost of corrosion-prevention programs

Courtesy Polyken Div., Bauer & Black

Vinyl tapes provide effective corrosion protection for pipe joints—an especially critical spot in an underground line

Courtesy Johns-Manville Corp.

To Foster

Courtesy Monsanto Chemical Co.

Junior Achievement companies in the plastics industry soon learn that attractive packaging can aid sales appeal and provide useful buying information for the prospective purchaser. R. G. Carter, production adviser to Pioneer Products Co., Springfield, Mass., gives the merchandise final inspection

ONE hundred and seventy-four of the most important companies in the entire plastics field are going out of business in May 1953.

They are closing up shop, liquidating inventory and equipment, retiring their capital stock, paying off their labor force, giving pink slips to skilled management. These are Junior Achievement companies, organized and operated by alert teen-agers as part of the national "learn by doing" business education program offered by Junior Achievement, Inc.

They are important, highly important, to the plastics industry for two basic reasons:

a) As forward-looking business men in a progressive industry, plastics people recognize the necessity for preserving and expanding the concept of our initiative enterprise business system. The primary purpose of Junior Achievement companies is to do just that by giving future business leaders a chance to learn basic economic facts.

b) These J.A. companies provide excellent opportunities for promoting an increased use of plastics and they can, in addition, be of incalculable value as part of the public- or community-relations programs of individual firms in the plastics industry.

Junior Achievement, Inc., is a national, non-profit educational organization which offers students in the last two years of high school the opportunity to learn about business by actually forming their own miniature corporations to manufacture and market a product or render a service.

A Finer Future

Companies in the plastics industry are encouraged to sponsor Junior Achievement enterprise in plastics

by Larry C. Hart*

Each J.A. company is sponsored by an adult business organization and advised by three employees of the sponsoring firms. Members of the groups are recruited in public and parochial high schools through the cooperation of school authorities. The companies meet and work in business centers maintained by Junior Achievement, Inc.

Starting the Business

Starting early in the fall, the dozen-odd members of each Junior Achievement company decide on the product they wish to produce or the service they wish to render, elect their own officers, and capitalize their miniature corporation by selling stock at 50 cents a share. Average capitalization is about $100.

With their capital they buy raw materials, pay themselves wages, (each youngster is both a member of the board of directors and a member of the labor force), and pay rent for working space and equipment until income from sales begins to roll in.

They manufacture their product, determine sales plans, hit the street to sell door-to-door or, if they wish, to retailers for re-sale. They keep complete records, set aside money to be disbursed to a non-profit project in lieu of taxes and, in May, wind up their business affairs by retiring the capital stock and paying a dividend if earned.

So the youthful enterprisers have come to grips with the problems of running a business. They have gained valuable and highly personal experience in business because they have been responsible for the operation of one. It is this experience—and the understanding of our business system which it develops—that makes Junior Achievement an effective public-relations program for all business.

Learning by Experience

The broad scale lessons learned by J.A. are made up of many small bits of experience. For example, a typical production-problem report made by Specialties Unlimited Co., a J.A. group in St. Paul, Minn., sponsored by the Great Northern Railway, states: "We found that cutting the plastic with a metal circular blade leaves a rough edge

* Vice President, Johns-Manville Corporation; President, Junior Achievement, Inc.

Courtesy Minnesota Mining & Mfg. Co.

Household Plastic Co., a Junior Achievement group which manufactures a plastic spool rack in St. Paul, Minn., is visited by Mayor John E. Daubney, center, and W. M. Bennett, Chairman of the Board of Directors of St. Paul Junior Achievement. Sue Wemple, 16, gives sales talk

Courtesy The Dow Chemical Co.

Fabrican Co., a J. A. group, is represented by: (standing, left to right) David Chapin; Joseph Mosher, president; Russell Skidmore, Dow Chemical International, Ltd., and (seated, left to right) Gilbert Lutz, production manager; T. J. deVries; and C. H. Keene of Dow International

which would have to be finished. We changed to a 1/16- by 4-in. Carborundum disk which finishes as it cuts."

A Portland, Ore., J.A. company, describes thus its manufacturing process for producing plastics foam snowmen for Christmas and rabbits for Easter: "Patterns of composition board are tacked to 1-in. foam board, which is cut by melting with hot leader wire on a jig around the edge of the pattern."

A group in Midland, Mich., sponsored by The Dow Chemical Co., learned a lot in producing a styrene alloy tray for candies and nuts. They report: "Sheet plastic was made pliable by heating on a radiant heating panel and then drawn down over a mold by a vacuum produced by a vacuum cleaner. When the plastic has hardened, edges were trimmed with a jig-saw. This created a problem since the heat from the saw blade caused the plastic to melt slightly, producing rough edges. We found the solution to be keeping water on the blade by the use of nothing more than a simple eye dropper."

In Bridgeport, Conn., two J.A. companies, each sponsored by The Singer Manufacturing Co., make household and baby's aprons requiring cutting and sewing. And in Springfield, Mass., Monsanto Chemical Co. sponsors the Pioneer Products Co. which buys rolls of lace-printed vinyl film, cuts it to size, sews hems, and packages and sells it for tablecloths.

But whether acrylic, styrene, vinyl, or other plastics are used, the Achievers themselves, their parents and relatives, their customers, and the adult advisers to the small companies, become more and more plastics conscious. "Plastics conscious" is an understatement—as anyone well knows who has been sold a plastics product by a Junior Achiever.

J. A. Plastics Companies

The plastics industry, through the S.P.I., has recognized and helped Junior Achievement by sponsoring an annual award for the best J.A. plastics company. Last year the fourth yearly award was won by Superior Plastics Co., a Brooklyn, N.Y., group sponsored by Remington-Rand, Inc. The judges were C. O. Bradford, Bakelite Co.; William H. MacHale, Naugatuck Chemical Div. of United States Rubber Co.; and Langdon Williams of the S.P.I. The president and vice-president of Superior Plastics were sent by the Society to N.A.J.A.C. (National Junior Achievers Conference)—a dead serious convention of Junior Achievement companies held last summer at Valley Forge Military Academy, Wayne, Pa. Presidents of other companies in the contest were also guests of the S.P.I. at the Conference.

This year, 29 members of the plastics industry are sponsoring Junior Achievement companies by providing adult advisers to one or more of the miniature corporations. And each of these sponsoring companies has the opportunity to utilize Junior Achievement's terrific potential for enlightened self-interest. As has been shown, general promotion for plastics materials is a natural by-product of sponsorship. Less obvious, but just as important, are several other factors with possibilities for community and public relations not yet fully explored.

Many of the 1000-odd adult business firms that sponsor J. A. companies throughout the country do so for but one purpose: to help youngsters help themselves and others through an increased knowledge of our business system. That's all to the good. But it would be even better if they would add a little selfishness to their motives—even a lot of selfishness.

The more industry capitalizes on participation *in* J.A., the more good is done *for* Junior Achievement!

Take, for an example, a sponsor who is glad—for purely altruistic reasons—to have three employees act as Advisers to a J.A. company. The Advisers do a good job with the younsters and the J.A. company is successful; it produces a good salable product, competitively priced. The Advisers let the youngsters run the firm, offering advice and counsel when the youthful enterprisers run up against snags. At the end of the year, the Achievers have learned a great deal from their experience and will be better citizens, better potential employees, better people for their participation in J.A.

And the Advisers, too, have learned a lot. They have been seeing the broad-scale problems that their employing company's management faces and which they do not ordinarily encounter in their own duties. So the company's sponsorship has been successful—even though the Achievers had never met the sponsor's president or even been inside the sponsor's plant.

Sponsor Participation

But the project has only been half as successful as it could have been if the sponsor—let's call him Mr. Smith—had leavened altruism with

(*Continued on* p. 186)

A dishwashing detergent is packaged in polyethylene bottles by Ko-Kem Products, a Junior Achievement organization. Shown below (reading clockwise) are the following members of company: Thomas Mroz, Gaile Ventresca, Anna Mae Onorad, Richard Kleiser, Paul Kazmierski, Janet McConnell, Joseph Martinelli, Arline Malecki, Cyril Fox, Joseph Sedley

Courtesy Koppers Co., Inc.

New Memory For Plastics

Perfected treatment for cast transparent thermoplastics gives materials high optical quality and dimensional stability under stress, strain, and fluctuating temperatures

PLASTIC memory, particularly as related to cast transparent plastics such as the acrylics, is a phenomenon which has always been a deterrent to those who want to obtain dimensional stability and optical perfection under stress, strain, and fluctuating temperatures.

Take an ordinary piece of cast acrylic, form it into a product or a component, put it back into a heated oven—and it goes back to its original shape as cast.

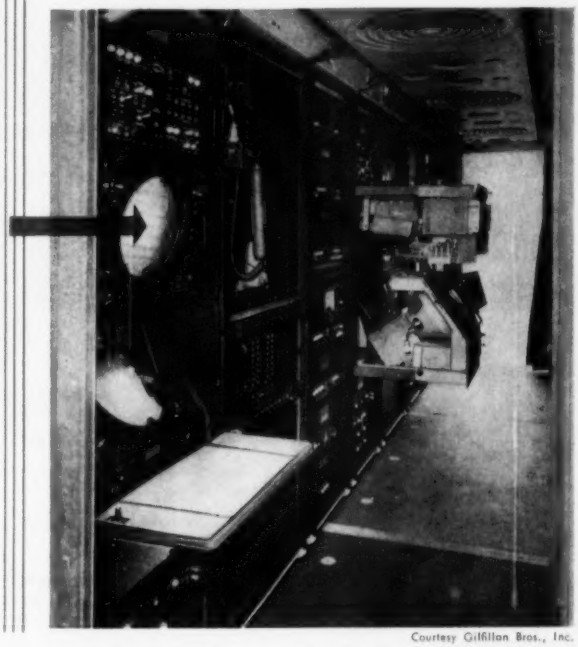
After more than five years of research, Perma Plastics Co., Glendale, Calif., has perfected and proved a method of reorienting the elastic memory of cast thermoplastic polymers. This treatment, still held secret, is declared to give the processed materials a completely new and dimensionally stable memory in any desired position by means of molecular realignment. The process not only overcomes the above mentioned stymie, but in addition provides finished parts with properties equal to grade "A" optical glass, complete dimensional stability, and freedom from strain and stress.

Premium Applications

Naturally, the process is expensive and is to date used only on premium applications. One example is an indexing ring that circles a cathode ray tube as part of GCA (Ground Control Approach), which is the official radar landing system developed and produced for the United States Air Force by Gilfillan Brothers, Inc., Los Angeles, Calif. It is also the official landing equipment for the air forces of 24 other nations in the Free World.

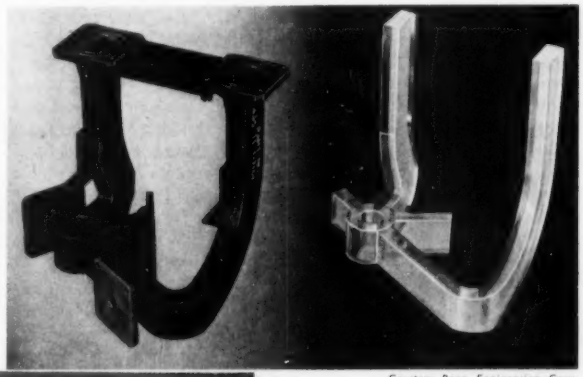
The GCA equipment weighs 18 tons, contains 1500 radio and cath-

(*Continued on p.* 190)



Courtesy Gilfillan Bros., Inc.

Arrow points to "new memory" acrylic ring circling cathode ray tube in GCA equipment. Ring must have good optical qualities and dimensional stability



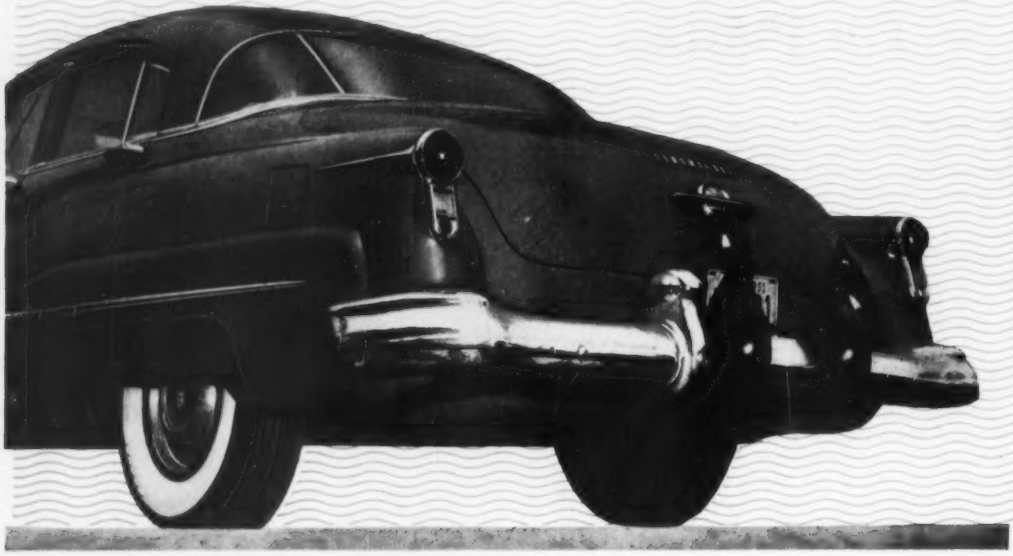
Courtesy Bone Engineering Corp.

Stabilized styrene mandrel (right) is used in electroforming piece at left

Courtesy Bone Engineering Corp.

Plastics lenses are formed in electroformed dies made from a stabilized acrylic matrix

PLASTISOL TAKES THE BUMPS



Typical installation view of new inflated vinyl plastisol guards for automobile bumpers. They are available in a range of colors and styles

Inflated bumper guards for automobiles cushion shocks; arm rests and trailer hitch covers are parallel developments

THANKS to polyvinyl chloride plastisols and the practical imagination of Jeff Corydon II, motorists need no longer put up with the annoying shock and noise caused by the clash of metal bumpers in today's dense traffic. By developing inflated slush-molded plastisol "Bump-Air" guards which cushion shocks like a rubber tire, inventor Corydon has literally taken the bump out of bumpers. Several types of bumper guards, as well as other related automotive items molded of the same material, are now being produced by Bump-Air, Inc., Barberton, Ohio.

"For years," declares Mr. Corydon, "motorists and truck drivers have enjoyed the benefits of inflated tires and of shock absorbers. Up to now, however, nothing has been done to take the bump out of bumpers. The logical answer is inflated guards, instead of those made of metal."

Carrying approximately 2 lb. of sealed-in air pressure, the vinyl plastisol guards are available in a choice of several colors, including simulated chrome, to blend with modern car hues, and in a variety of designs to fit different makes and models. Retailing at from $3.15 to $14 each, depending on style, size, and color, they may be used in conjunction with the standard metal guards supplied by car manufacturers, or as a replacement for them. The plastic units are secured to the front or rear bumper by means of a sturdy bolt, utilizing metal adaptor plates which insure a tailored fit to the bumper contour. Weight of the plastisol material in one of the guards ranges from ¾ lb. to 5 lb., the average for a passenger car being about 2¾ pounds.

These new vinyl automotive accessories take the shock out of all routine contact with other cars in driving and parking, eliminating noise, increasing passenger comfort, and preventing mechanical shock from being transmitted to the frame of the car. They also eliminate the unsightly scratching, peeling, and denting of chrome plated bumpers. Cars equipped with a set of these guards have been driven into a solid wall at 10 m.p.h. without damage. In an even more dramatic test, a 15-ton road roller was run over several of the inflated guards without causing them to burst, or otherwise impairing their serviceability.

Plastisols Superior

Vinyl plastisols used in molding the guards are supplied by American Anode, Inc., Akron, Ohio, and Reslac Chemicals, Inc., Chicago, Ill. The choice of vinyl plastisol for this application was based on its many points of superiority over other materials, including wide range of inherent colors, resistance to oxidation and sunlight discoloration, and resistance to grease, water, and detergents, as well as freedom from brittleness and cracking on exposure to low temperatures.

The wall section of the bumper guards is approximately 3/16 inch.

Courtesy The B. F. Goodrich Co.

Aluminum molds are used for producing hollow, inflated bumper guards by slush molding. Plastisols have good weathering and grease resistance

Air under pressure is introduced through a hypodermic needle into standard bumper guard. Also shown are smaller and larger types

They are designed with a slot-like recess in the back and an outer lip wall to accommodate the steel squeeze plate which shapes them to the proper bumper contour and retains the head of the fastening bolt.

The plastisol bumper guards are made by a slush molding process in split aluminum molds. Details of the actual molding equipment and process are held confidential by the manufacturer. Following curing of the products and removal from the molds, a hypodermic needle attached to an air line is inserted in the recessed area and the guard is "inflated" to a pressure of 2 p.s.i. Once inflated, the guards will withstand tremendous pressure without damage.

Scratches Eliminated

Present output of the Bump-Air guards is approximately 3000 units per month, with plans calling for a considerable production increase. The manufacturer is also developing a nation-wide system of distribution to handle the various plastisol products made by Bump-Air, Inc. These include, in addition to the standard type guards, a lower priced version known as the Nub and a Jumbo edition called the Pushin' Cushion, which is attached to the push plates of tow trucks, wreckers, Jeeps, etc., to eliminate scratched and damaged passenger car bumpers, lights, and rear decks, when stalled cars are pushed. Also under development are arm rests making use of the inflated principle.

Another Bump-Air molded plastisol item is a small cup known as the Hitch-Hood which forms an air tight seal on ball trailer hitches when not in use, protecting them against damage and loss of grease and insuring that grease is not transferred to hands or clothing. This item, also made by the slush molding process, does not involve an inflating operation.

Also molded of vinyl plastisol is a protective cup for trailer hitch ball

A new set of plastisol bumper guards is examined by the inventor (left) and his plant superintendent

Courtesy The B. F. Goodrich Co.

What About

ONE of the most important technological achievements in the growth and quality improvement of vinyls has been the improvement of stabilizers. As demand increased for higher maintenance of color standards, as faster processing placed more rigid requirements upon heat stability, and as consumer insistence upon light-fastness and longer service life increased, heat and light stabilizers were vastly improved.

Development of vinyl stabilizers has been set back occasionally by cost-conscious manufacturers and fabricators who, for increased profit, tried to flood the markets with shoddy, poorly formulated, totally inadequate products. This tendency has, at times, been so demoralizing that a recent meeting of the S.P.I. was devoted almost exclusively to breast beating and self recrimination in an effort to induce the industry to develop and retain the highest standards of quality.

A Case in Point

The shower curtain field is a case in point. Vinyl shower curtains can be good. But when the processor tries to save a few cents per curtain by the use of inadequate plasticizers and stabilizers, the result are sleazy, flimsy, greasy films which turn rancid, black, and embrittled after a totally inadequate period of service.

Selection of a vinyl stabilizer may add to or reduce the raw material cost per pound of a vinyl compound. It may have an even more profound influence upon the ultimate cost of a compound. The proper choice of a stabilizer may, for example, permit processing speeds to be increased as much as 20%, with consequent labor and overhead reductions. Even when greater production speed is not gained, stabilizer choice can improve surface appearance and reduce rejects. Frequently, a poor choice of stabilizers will result in a substantial amount of down-time while expensive calenders and embossing equipment are cleaned (all too often with inadvertent damage to them) of burned residues or of undesirable spew. The rejection of entire lots of material because of "color drift" is another cost factor which must be added to the balance sheet of an improper stabilizer.

Vinyl troubles do not necessarily end with the initial processing of an improperly stabilized compound. If the film or sheeting requires a printing operation, the print may not stick or it may offset to the back of the sheet. Some stabilizers, like some plasticizers, have the faculty of floating organic pigments to the surface, thus creating crocking problems. Such stabilizers obviously should be avoided where crocking must be kept at a minimum. Furthermore, when the film is to be sealed electronically, stabilizers must be selected accordingly.

Stabilizers for plastisols must impart heat and light stability

Stabilizer Types

Of the many stabilizers available, commercial practice has settled upon the following general types:

Salts of the Alkali Metals: The only significant members of this family are the sodium phosphates. They are used primarily as light stabilizers and contribute little or nothing to the heat stability of a compound. Indeed, with certain systems they may have an adverse effect—requiring an additional primary stabilizer to maintain initial stability. They also possess the property of replacing the barium or calcium salts of some organic pigments and thus changing the basic color of these pigments. They are usually used in conjunction with a good heat stabilizer to upgrade light stability.

Salts of the Alkaline Earth Metals: The most commonly used alkaline earth metals are calcium, strontium, and barium in ascending order of stability. The inorganic salts of these metals are no longer too important, although some use was made of calcium silicate and calcium oxide at one time. The organic salts and, particularly, the soaps of these metals, have gained in importance. Calcium stearate, while only an indifferent heat stabilizer, is nontoxic and is widely used for its excellent lubricating properties. The strontium compounds have been largely replaced by the similarly acting but cheaper barium soaps—especially barium laurate and barium ricinoleate. These are usually used in conjunction with a cadmium soap with which they show excellent stabilization properties. Barium laurate has the disadvantage of plating out upon calender rolls and embossing equipment. Barium ricinoleate, under certain conditions, will also spew from the completed product, imparting some undesirable characteristics.

Stabilizers.?

Selection of a proper stabilizer to meet specific service requirements can make or break a vinyl product **by Louis A. Tomka***

Salts of the Heavy Metals: Lead salts have been widely used for the stabilization of vinyls. Low cost, good heat stability, and excellent electrical properties make their use advantageous. They possess, however, the disadvantages of high specific gravity, a high order of toxicity, lack of clarity, and will stain in the presence of sulfur. Most of them possess poor light stability.

Cadmium soaps are very similar to lead. They are usually used with barium and epoxy materials to yield formulations of good heat and light stability. Like lead, they have a high specific gravity, are toxic, and will stain with hydrogen sulfide.

A serious defect of this type of stabilizer is its lubricating action. Some lubrication is essential, but excessive amounts may cause difficulty in printing and heat sealing.

An interesting non-staining, non-

Printing and heat-sealing problems may be solved by selection of correct stabilizer

* Technical Service Engineer, Metal & Thermit Corp., New York, N.Y.

Prevention of embrittlement is vital to success in shower curtain field

Important to garden hose is resistance to outdoor degradation

toxic member of this family of the heavy metals is zinc which can be used together with calcium and epoxy compounds to yield films which will not stain and are not toxic, but in which, unfortunately, heat stability leaves much to be desired.

Organo - Tin Derivatives: The compounds in this group, with the metal directly connected to a carbon atom, are completely miscible with the plasticized vinyl matrix. They are low in specific gravity and will not stain under most conditions. Toxicological data are still incomplete. The oxygenated organo-tins exhibit outstanding light stability and fair to good heat stability; considerable data on natural outdoor aging have been gathered about these compounds.

A recent development which has spurred on the spectacular growth of rigid vinyls in this country has been the discovery of derivatives containing organo-tin sulfur. Heat stability is so remarkable that in many applications as little as ¼ of 1% of stabilizer based on the resin affords adequate protection. Another feature of these compounds is the ease with which they stabilize phosphate plasticizers. This has permitted the compounder broader latitude in achieving desired properties in his formulations.

Organic Compounds: Various types of amines, phenolics, and epoxy compounds have achieved some commercial use. The epoxy types have found the greatest application particularly in conjunction with barium and cadmium derivatives and the oxygen type organo-tins.

Applications

The stabilizers discussed find use in a wide variety of fabricated vinyl articles. To some degree, the choice of stabilizer or stabilizers is a matter of personal preference. To an even larger degree, the service requirements of the completed article will determine the ultimate choice. As an indication of this, some of the processing and service requirements of some typical vinyl applications—as related to stabilization—are mentioned.

Flooring: In the rapidly growing flooring field, clarity is not too important. Only moderate heat stability is required. Good surface finish is extremely desirable. Major requirements are excellent light stability inasmuch as long flooring life is expected. Complete freedom from staining is essential since many major areas in the U. S. have high concentrations of sulfides in the air or water supply.

Hose: Clarity is important in some formulations but is not a factor in pigmented opaque stocks. Resistance to degradation from outdoor use is probably the most important requirement.

Film: Exceptional heat stability is usually required because of high processing speeds. Color shift should be at a minimum to assure uniformity of color during a long run and to permit rework of trim. Excessive lubricity should be avoided to prevent printing and heat-sealing problems. In this respect, it is sounder practice to use a non- or poorly-lubricating type of stabilizer and add additional lubricant as required by the calendering operation.

Stabilizers should contribute to the ease of calendering and should not create additional calendering problems by coating of calender and embossing rolls. Down-time and reruns are extremely costly. Stabilizers for film should be selected with an eye towards elimination of sulfide staining—particularly in the case of those articles which may be used in contact with synthetic or natural rubber. Stabilizers which impart sufficient light stability so that colors do not noticeably change and which prevent premature embrittlement of the film during its service life should be used.

Sheeting: Heat stability may or may not be of prime concern in this application. This will be dependent upon the nature of the product made, the type of equipment used, and the practice of the particular plant. Clarity, except in small measure, is usually not required. Good light stability is essential, either in the sheet or in the top coating which is frequently applied to sheeting. Wherever sheeting is to be placed in contact with foam rubber or materials containing sulfur, non-staining types of stabilizers should be used.

Rigids: The processing of rigid vinyls poses many technical problems both in terms of equipment and stabilization. The absence of plasticizer renders the plastic less malleable and extremely high heats are required for extrusion and calendering. Internal frictional heat generated in the vinyl is also great. This operation requires a stabilizer of exceptional thermal stabilization properties.

Extruded Blown Film: As in the rigids, outstanding thermal stability is required. Degradation of the vinyl will create pin-holing with consequent loss of production because of rejects and cleaning-up time. Sparkling clarity is often required.

Organosols and Plastisols: Heat requirements of an organosol or a plastisol are somewhat different from those previously mentioned. These compounds receive thermal shock of high intensity but short duration. Obviously, stabilizers for these types of material should prevent any color change during this cycle. Light-fastness is important in many applications, as is freedom from any staining proclivities.

In the immediate future, it seems likely that rapid and continuous growth of vinyl compounds will occur in the floor-covering, rigid, and food packaging fields. Present products, probably somewhat modified, will find increasing utilization in applications involving outdoor service. Interest is growing, for example, in the potential use of vinyl as awning material.

All photos with this article courtesy Bakelite Co.

Vinyl sheeting for upholstery must have good light stability; in most cases, non-staining stabilizers must be used

NEWS AND VIEWS OF PLASTICS PROGRESS

STOKES *plastics review*

VOL. 2
NO. 2
1959

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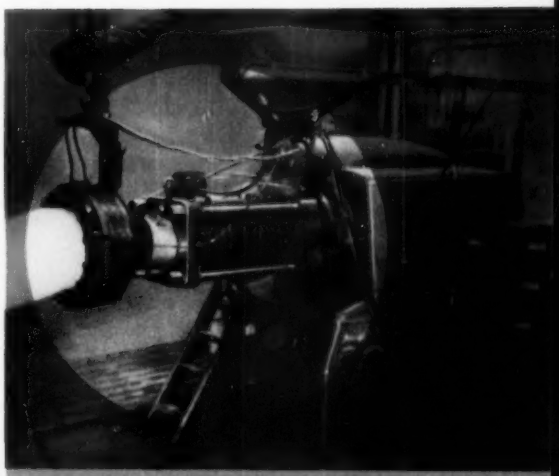
Six Extruders Produce Plastic Sheeting for the Famous Hedwin Place Mats

Plasticized vinyl material for place mats, rugs, women's handbags and other sheet applications is produced on six Stokes-Windsor Extruders at the Hedwin Corporation, Baltimore, Md. Sheet is being made in thicknesses from .010" to .100" to extremely close tolerances.

Other extrusion work at Hedwin Corp. includes development work on rigid sheeting and other rigid extrusions and on polyethylene drum liners.



Close up of one of the six Stokes-Windsor Extruders at Hedwin Corp. showing plasticized vinyl material being extruded in thicknesses of .010" to .100".

Operator checks one of six Stokes-Windsor Extruders in the Baltimore, Md., plant of the Hedwin Corp. Material being extruded is plasticized vinyl.

The six Stokes-Windsor Extruders at Hedwin Corporation include one Model RC-65, two Models RC-100 and three Models RC-200. Numerous major advantages mark these multi-screw extruders. Dimensional control is remarkably accurate because pulsation is at a minimum. Material-flow is positive because the multiple screws drive the material from one vane to another; it cannot seize or revolve as a mass. Mixing is thorough; compounding, color dispersion and extrusion are often done at a single pass. Heat build-up from friction is so low that little power is wasted and efficiency is high in terms of output per hour.

Two new bulletins, Nos. 525 and 550, describing the latest Stokes-Windsor Extruders, are available, free, upon request.

EDITORIAL

This Custom Molder Saves Money with Automatic Molding Presses

Purely on the basis of accounting and simple mathematics, automatic molding is making important strides among custom molders.

Here's how the president of a well-known custom molding company put it recently: "For some time I have made four parts for one of my customers. I used a 20-cavity mold on a 150-ton semi-automatic press. On a 3-minute cycle making 5 of each piece on each cycle, I got 400 pieces per hour. With labor at $1.50 my direct labor cost per piece was therefore .375 cents each.

"This was a very good figure if I could hold it all the time. Sometimes I could build up an inventory and supply the customer from stock. Unfortunately, the customer's demand for these pieces varied widely at times. All too often I'd have to run only one part to meet my customer's demands and I could run only 5 cavities of the mold. It still took one man at $1.50 per hour, bringing my direct labor cost to 1.5 cents each.

"So I studied the possibilities of smaller fully automatic presses. Of course, these aren't perpetual motion machines; you have to feed them and take away the finished parts, but one man can handle 10 such presses at a time without any difficulty. To be sure, I don't have 10 presses but my labor charge is still only 15 cents per hour per press, since one of my operators needs only a tenth of his time for each press.

"I'm still on a 3-minute cycle and use a two-cavity mold so I get 40 pieces per hour from the press. My labor cost is still .375 cents per piece. This is the same as the semi-automatic cost and I don't have any more of those high-priced molds and high-priced runs at fractional capacity on the big press.

"Meanwhile, I can keep my production in balance with the customer's demand by varying the number of presses I use for each part."

This man's report tells us why many custom molders are giving such serious attention to fully automatic molding.

A brochure on "Fully Automatic Molding", describing the origins, growth, uses and advantages of automatic molding, is available, free, upon request.

How to Save 83% on Plastic Molded Parts

Paragon Electric Company, Two Rivers, Wisconsin, manufacturer of electric timing devices, tested in-plant molding of plastic parts on a Stokes plastics molding press. The first job was an outlet assembly for the bottom of the De-Frost-It unit, an automatic refrigerator defroster made by Paragon.

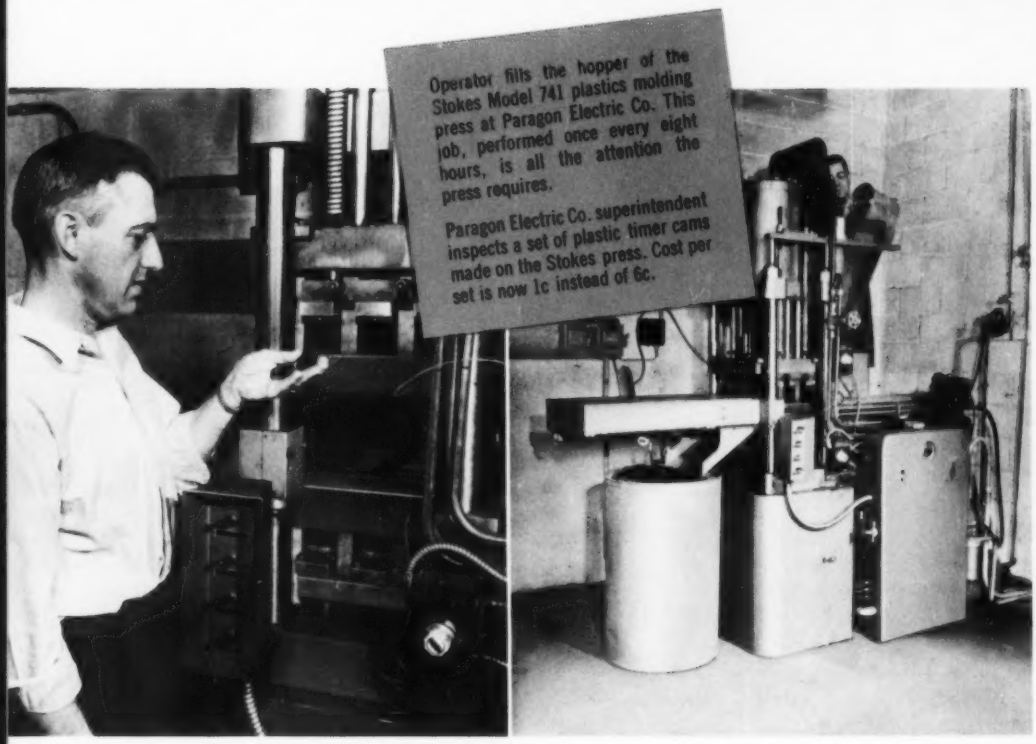
When the outlet assembly was produced with complete success, Paragon decided to make two plastic timer cams the same way. The parts were intricate in design and there was some doubt expressed whether they could be made by compression molding. A knife-sharp edge was required at one point and there was much flash to be removed.

However, the potential savings were great enough to justify every effort to attain success. Consequently, a Stokes Model 741, 50-ton fully automatic compression molding press was installed at Paragon Electric in April, 1952. 12-cavity molds were developed for both the bottom and moving cams. Flash was removed by tumbling. Estimated production of 575 sets per hour for the moving cams was met and bettered. Production is now at the rate of 720 sets per hour. Cost per set has been reduced from 6c to 1c. And the entire operation is completely automatic. The only manual labor required is the filling of the hopper about once every eight hours. No special handling is required.

"Mold costs will be completely liquidated before the end of the year," stated George J. Platt, vice-president of Paragon Electric Co. "Savings

"VARICON" CONNECTORS . . .

Closeup of Elco "Varicon" miniature connectors that work like giants, showing detail of the precisely formed parts made on the new Stokes Model 80C molding press. The parts are molded in general-purpose, mica-filled phenolic or alkyd resins.



Operator fills the hopper of the Stokes Model 741 plastics molding press at Paragon Electric Co. This job, performed once every eight hours, is all the attention the press requires.

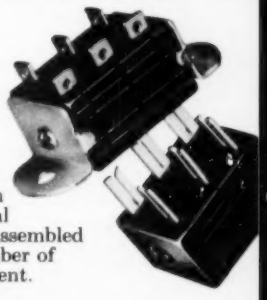
Paragon Electric Co. superintendent inspects a set of plastic timer cams made on the Stokes press. Cost per set is now 1c instead of 6c.

are expected to run as much as $40,000 per year," he added.

Paragon Electric Co. was organized in 1910 in Chicago as a sales organization. It moved to Manitowoc, Wisc., in 1917 and to Two Rivers, Wisc., in 1940. The firm did a considerable amount of work for the government during World War II. Its timing devices control intervals ranging from three seconds to one week and have hundreds of uses. They are built into the products of leading manufacturers and also are sold on the market. Just introduced is the Nightrol, a low-priced device for turning down thermostats during the night.

A bulletin describing the Stokes Model 741 Press is available, free, upon request.

. . . MADE ON NEW MODEL 800 MOLDING PRESS



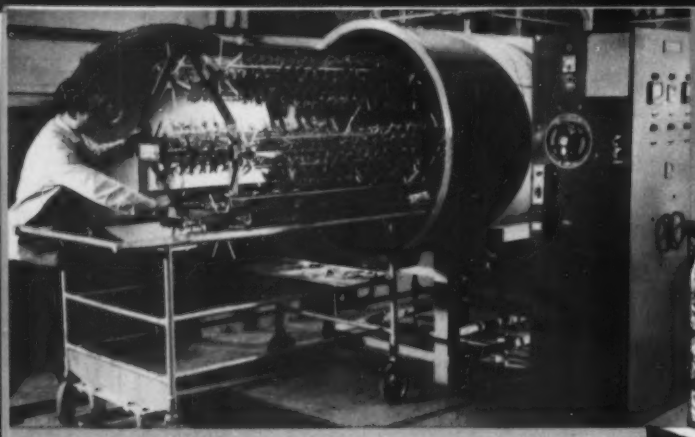
One of the first production models of the new Stokes Model 800 fully automatic plastics molding presses has been installed at Elco Corporation, Philadelphia, Pa., for molding miniature "Varicon" electrical connectors. Founded in 1947 to manufacture tube sockets and shields, Elco Corporation recently began making this new type of electrical connector which provides a positive means for connecting electrical assemblies or sub-assemblies to each other.

The "Varicon" connector components consist of the following basic parts: molded phenolic end sections precisely made to critical tolerances; brass, phosphor bronze or beryllium-copper contacts; and a molded phenolic center section which dovetails perfectly with other center sections as well as with end sections. The connector sections may be used in any needed multiple to obtain a desired combination of electrical contacts. Individual "Varicon" connectors may be assembled in multiple to provide any number of variations in polarity arrangement.

Elco "Varicon" connectors have a current rating of 30 amps and a rated voltage of 1330 volts (tolerate 4000 volts between closest terminals).

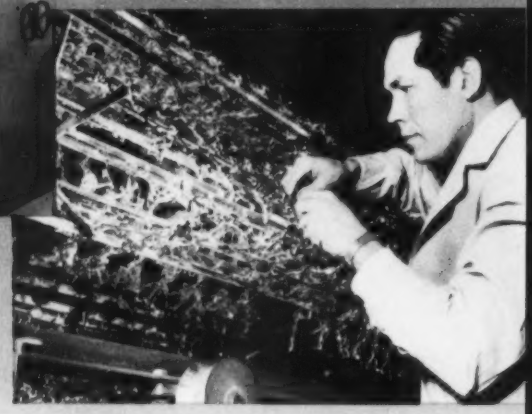
A new bulletin, No. 513, describing the Stokes Model 800 Press is available, free, upon request.

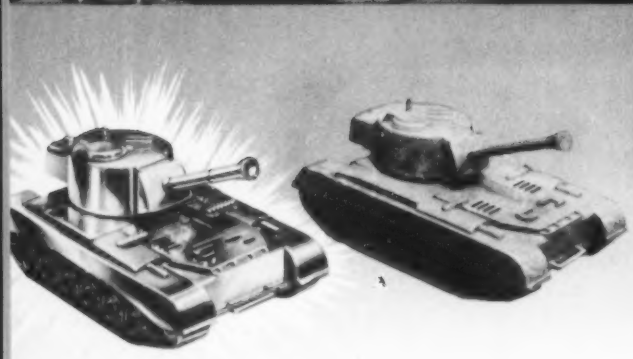
STOKES



Plant supervisor loads Stokes vacuum metallizing unit with a full rack of plastic toy soldiers made from reclaimed scrap acetate at Ideal Toy Corp., Hollis, New York.

After metallizing, chamber is opened and toy soldiers appear with a brilliant metallic lustre.





Before-and-after view of toy miniature General Patton tank. Tank on right is unmetallized; tank on left is metallized. Tanks are made of molded styrene. Metallizing permits use of scrap plastic.

Metallized Plastic Toys Look "Realer"... Sell Better ... Cost Less

Little Johnny is being fooled these days. His favorite toy tanks, soldiers, and cars are made from styrene or scrap acetate plastic and metallized to look like the real thing. But he's perfectly happy with the result ... and so is the manufacturer, because he's saving money on every toy he makes for Johnny!

Ideal Toy Corporation, Hollis, New York, world's largest toy manufacturer, began pioneering in the plastics field back in 1936. Keeping pace with new developments in the plastics industry, the firm recently purchased a Stokes vacuum metallizing unit for metallizing plastic toys. It's been found that a beautiful metallic lustre can now be put on almost any plastic product produced at Ideal Toy, regardless of the type of plastic compound it was made from. Cost-savings, as compared to former plating methods, have been very great.

The Stokes Model 426 vacuum metallizing unit at Ideal Toy Corp. is in operation 24 hours a day, 6 days a week. Plastic toys are either dipped or sprayed with lacquer, prior to metallizing, to give a good base for the aluminum finish. The toys are baked at about 150° F., then placed in the Stokes vacuum metallizer from 18 to 20 minutes, depending on the type of plastic being used and the time required to reach the necessary vacuum. Flashing is from 9 to 15 seconds, depositing aluminum coating on the toys. After metallizing, the toys are given another coat of lacquer to give added protection to the aluminum coating.

Founded in 1906, Ideal Toy Corporation is a leading manufacturer of plastic toys, housewares and industrial products. Its plant area covers 500,000 square feet; its employees number 3,000.

A new catalog, "Vacuum Metallizing Today", is available, free, upon request.

STOKES

F. J. STOKES MACHINE COMPANY
5534 TABOR ROAD, PHILADELPHIA 20, PA.

STOKES MAKES Plastics Molding Presses / Industrial Tabletting and Powder Metal Presses / Pharmaceutical Equipment / Vacuum Equipment / High Vacuum Pumps and Gages / Special Machinery

PRINTED IN U.S.A.

Play Kits in Plastics

Colorful acetate, styrene, and vinyl toy medical equipment is attractively housed in simulated leather grain styrene kit

Molded acetate parts include stethescope, hypodermic, and otoscope. X-ray scope is styrene; washable apron is 4-gage vinyl

THREE of the toy industry's most popular plastics—acetate, styrene, and vinyl—are being used in a series of clever doctor's and nurse's play kits which are currently finding vogue among the younger set. Each of the kits contains an assortment of realistic instruments that bring the perennial favorite game of "make-believe doctor" to life.

By using plastics for most of the instruments in the kits, the manufacturers not only effected economies in production, but maintained the strict hygienic requirements demanded in a toy of this type. The durable parts are harmless, easy to clean, and the integral color can not chip or scrape off.

Typical of many such kits now on the market are the doctor and nurse sets being manufactured by Transogram Co., Inc., New York, N.Y.

Both kits are housed in identical carrying cases of medium-impact styrene with a simulated leather grain effect on front and back. The doctor's kit is black and the nurse's is red. The three parts of the case—cover, rear housing, and handle—are injection molded in one combination mold on a 20-oz. Lester-Phoenix machine. In assembling the case, a simple hinge arrangement using two pins locks the front cover to the rear housing. Molded-in lugs slipped through two openings on top of the case hinge the handle in place.

Most of the instruments in the kit are molded of acetate in contrasting colors—red, white, yellow, green, and orange—and nearly every one has movable parts that swivel, spring up and down, or slide to simulate operation of the actual instrument. Acetate pieces include stethescope parts joined by rubber tubing, a hypodermic, an otoscope, eyeglasses, a wrist watch with flexible band, a head "mirror" with a vinyl strap, a film strip printed with enlarged views of germs, and an acetate unbreakable thermometer.

The largest two pieces, a microscope and an X-ray scope, are molded of styrene and a washable apron is fabricated of 4-gage vinyl.

In the nurse's kit, styrene scissors, spoon and bowl are substituted for the X-ray scope and the head "mirror."

A similar set of kits, made by American Metal Specialties Corp., Hatboro, Pa., is carried in cardboard cases and contains styrene cups, funnel, spoon, racks, stetnescope parts, tips, scissors, and forceps. The eyeglasses are made of acetate and the flexible wrist watch is polyethylene.

In both series of kits, other medical accessories, such as cotton, gauze, pills, etc., are included.

Vinyl-Covered Trench Silo

VINYL film, as an effective and economical part of scientific farming development, helps to protect and preserve grass silage intended for winter feeding of livestock. The system is based on a late 18th century method for preserving green fodder by storing it in a trench or pit.

In contrast to upright, circular—and expensive—silos, the trench can be easily and quickly dug with a bulldozer, leaving a ridge of dirt as a rampart on three sides. The silage is then packed into the pit and covered with a weatherproof, air-tight vinyl cover. Unlike unprotected outdoor storage methods, which can cause top spoilage up to a depth of 12 to 18 in., and dirt covered storage, which ruins the taste of the silage, all of the vinyl-protected grass and corn will retain its nutrient values until late winter.

The edges of the 0.008-in. cover are buried in sand or gravel for effective sealing. When the silage is to be used for winter feeding, one of the edges is lifted up and the cover is rolled back as the feed is used up.

The cover is fabricated by Kennedy Car Liner and Bag Co., Inc., Shelbyville, Ind. from Monsanto's Ultron low-temperature flexibility film. The weatherproof film will not crack at temperatures as low as −50° F.

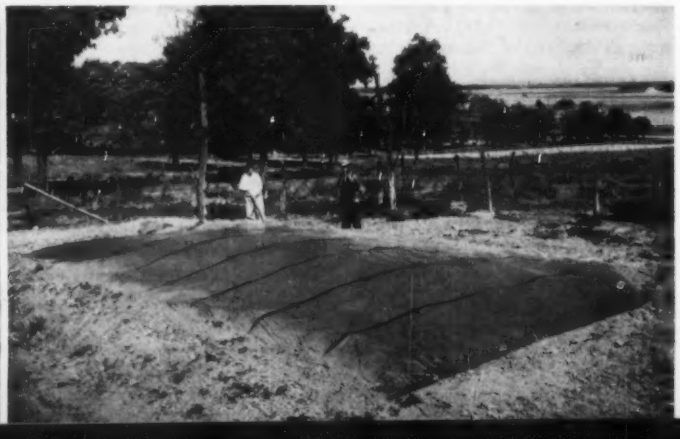
Standard size available is 22 ft. wide by 30 ft. long. To cover larger areas, units may be overlapped or bonded together with vinyl tape.

Photos courtesy Monsanto Chemical Co.

Weatherproof vinyl film rolled over a silage-filled trench serves to protect the green fodder against spoilage during the winter months

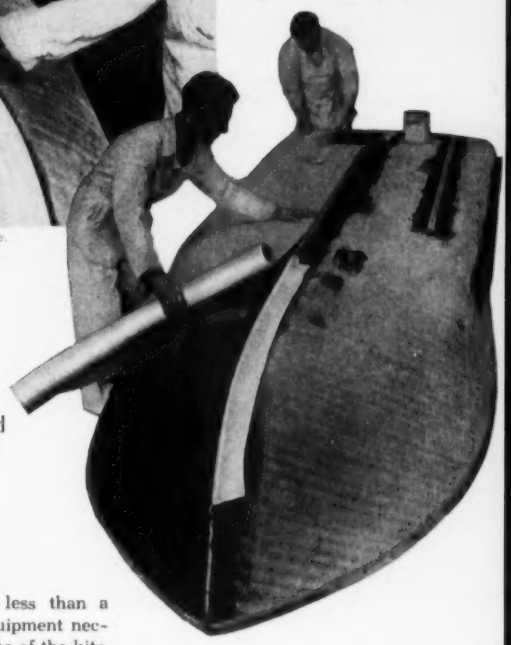
Dirt shoveled over edges of the vinyl cover helps to keep the silo air-tight

To remove cattle feed from the trench silo, one end of the vinyl sheet is raised and rolled back. When the silo is empty, the cover is folded up and stored until next season



Polyester resin-impregnated fibrous glass coverings that can be easily and economically applied over a wooden boat hull provide both effective protection and an attractive appearance

A primary coat of polyester resin, which is spread on the clean surface of the hull and allowed to set until tacky, serves as permanent anchor for the cut lengths of fibrous glass cloth



Photos courtesy Pacific Plastics Co.

OLD BOATS MADE NEW with home-applied

reinforced plastics materials furnished in kit form

IN A new approach to boat maintenance and repair, do-it-yourself kits now make available reinforced plastics boat coverings that can be applied simply and economically by any handy home-mechanic.

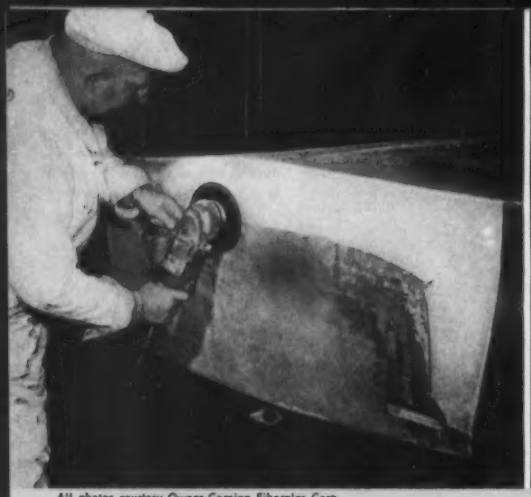
Incorporating the advantages that have made the all-reinforced plastics boat hulls so popular among boating enthusiasts, the versatile coverings have found an equally eager acceptance. Possibilities are many. Old and weak wooden hulls can be completely reconditioned; new wooden boats can be guaranteed extra years of serviceable wear; and holes or minor injuries to a hull can be repaired with much less time, labor, and expense than would be involved if wood were used.

To fully cover a rowboat or similar hull in somewhat less than a day's time, the only equipment necessary, in addition to one of the kits, is sand paper and a sanding block or power sander, scraper, paint brush, and squeegee. The kits themselves contain rolls of Fiberglas cloth woven from yarns supplied by Owens-Corning Fiberglas Corp., New York, N.Y., as well as polyester resin and a catalyst or hardener. In contrast to the molds and curing temperatures used to mold the all-reinforced plastics boat hulls, the home-applied covering can be laminated to wooden surfaces and cured under normal temperature, or, if faster cure is desired, by exposure to sunlight.

Any wooden boat hull, whether sheet plywood, molded plywood, or planks, may be covered with the resin-impregnated fibrous glass. The surface is first thoroughly sanded until all the paint has been removed. Holes, cracks, and depressions are filled with any commercial crack filler and the smooth finish cleaned of grease or oil.

The resin and the catalyst are then mixed together in predetermined proportions and in quantities based on the size of the surface to be covered.

The mixture is then applied over the wooden surface with a stiff brush and allowed to stand for 15 to 30 min. at a temperature of about 65° F. until it has become tacky enough to act as a permanent anchor



All photos courtesy Owens-Corning Fiberglas Corp.

1 Wooden surface is prepared for reinforced plastics covering by thoroughly sanding, removing grease and oil, and filling holes

2 Polyester resin mixture, including hardener and pigments, is then brushed on surface and allowed to set for 10 min. at 65° F.

4 Second coat of polyester resin mixture is immediately applied over the cloth covering and cured about 3 hr. at 65° F. until it is a tack-free, tough, and practically impenetrable skin

for holding the Fiberglas cloth in place. The individual lengths of cloth, which have been cut to allow for a slight overlap, are carefully smoothed on over the resin and squeegeed to remove wrinkles and blisters.

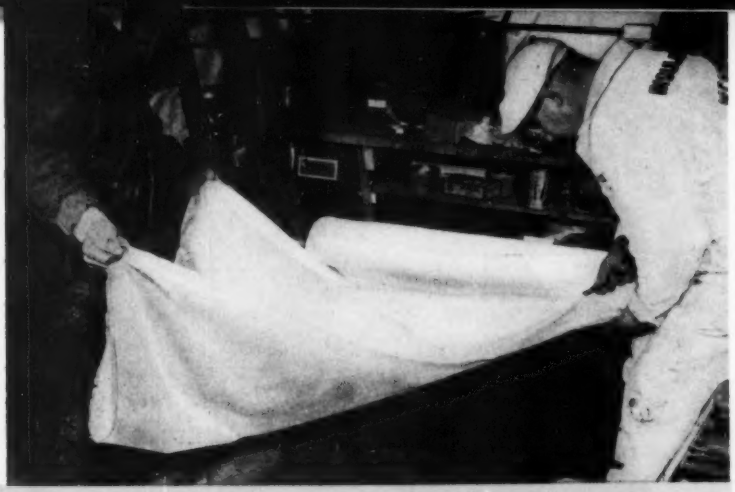
A second coat of resin is then applied on top of the Fiberglas. To cure this second coat into a tough, practically impenetrable skin, the resin is allowed to dry for approximately 3 hr. at 65° F. Some of the companies supplying these kits furnish two different catalysts, each formulated for different weather conditions. One catalyst will be activated into generating enough heat for cure only on direct exposure to sunlight for 20 min. to 1 hr.; the other is a quick-setting type that will react within 45 min. without sunlight or locally applied heat.

Finish

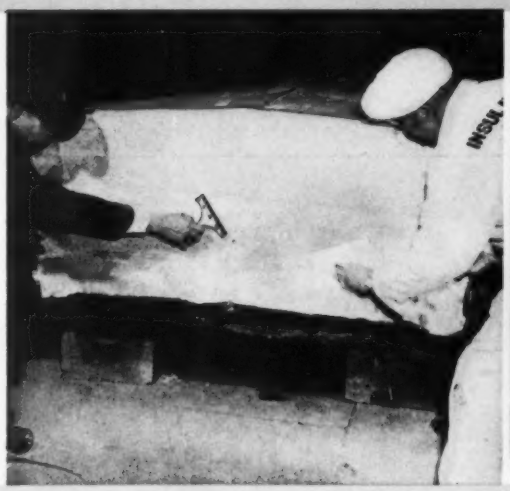
After curing, all excess material of the covering is trimmed away and the surface is lightly sanded. A third coat of resin is then applied and allowed to cure. The final cured finish is glossy.

The natural coloring of the resin finish is translucent but most of the kits offer a wide range of pigments —red, yellow, green, buff, blue, white, olive drab, and brown—that can be added to the resin-catalyst mixture. If uncolored resin is used, the cured surface can be painted as desired or left in its natural state.

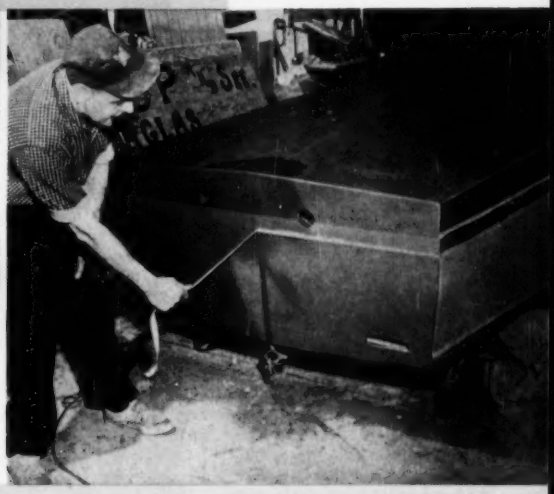
The reinforced plastics covering is a one-time, permanent application



3 Fiberglas cloth, measured to exact length and allowing for slight overlap, is cut from the bolt. Cloth will be applied to the tacky resin-coated surface of the hull and smoothed down



5 Immediately after application of second resin coat, wrinkles and blisters in covering are smoothed down by squeegee or hand



6 After sanding, third coat of resin—in colors, if desired—is brushed on. Tape is used to mask off areas not to be colored

and brings to an end the monotonous jobs of recaulking, puttying, and frequent repainting which have long plagued boat enthusiasts.

Advantages

Since the Fiberglas strands are inorganic, they cannot be penetrated by worms, harmed by barnacles, or weakened by any chemical or corrosive matter found in fresh or salt water. The use of the Fiberglas lamination actually increases the strength of the boat hull many lb. per sq. in., greatly reducing the danger of damage which may be caused by floating debris.

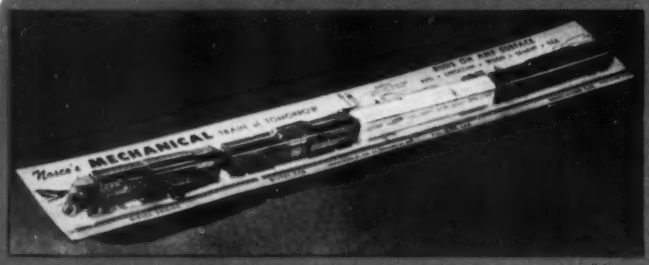
The "glass skin" is equally valuable in increasing the speed of the boat. Algae will not cling to a fibrous glass-reinforced plastic boat and the smooth bottom and low water pick-up of the covering eliminate water-logging with its tendency to slow the speed of the boat.

When used for repairing wooden boats, the reinforced plastics covering effects many economies. One company has estimated that the use of the covering for repairs reduces the time and labor involved by some 60% and repairing costs by as much as 80% when compared to old fashioned methods.

Reinforced plastic boat covering kits are available from Glass Plastic Supply Co., Linden, N.J.; Kristal Kraft Inc., Palmetto, Fla.; Pacific Plastics Co., Seattle, Wash.; Thalco Glass Fiber Products, Los Angeles, Calif.; and U-Mak-It Products, New York, N.Y.

PLASTICS

Hazards of overloaded and shorted electrical circuits can be sharply reduced by a new type of electric plug encased in sturdy Beetle urea. The plug contains two small replaceable fuses attached to each of the prongs. When the plug wire is shorted or overloaded, the fuses "blow," leaving the rest of the circuit undisturbed. Plugs made in ivory or brown by Noma Electric Corp., 55 W. 13 St., New York 11, N. Y.



Model train set—long-time favorite of children everywhere—is made up of individual, brightly colored cars that can easily be coupled or uncoupled. Each unit is molded in one-piece of styrene. A strong wind-up spring motor in the engine drives the train over wood, linoleum, or rugs. Two different sets are available—a freight train or a modern streamliner—from Nosco Plastics, 17th & Cascade Sts., Erie, Pa.

Lustrous cover knob and handle of a glass-lined stainless steel teamaker are molded of Tenite I cellulose acetate. The attractive unit can also be used as serving decanter. In either application, the handle and knob retain their pleasant feel. The parts are corrosion-resistant and easy to keep clean. Both are molded by Breyer Molding Co., 2536 W. Lake St., Chicago, Ill. for Teamakers, Inc., 35 E. Wacker Drive, Chicago, Ill.

Pastel-colored baby cup, especially designed to eliminate baby's feeding-time problems, is molded of styrene. The wide base of the cup prevents the child from tipping it over, while a small opening in the indented drinking lip of the removeable cap allows just enough milk to pass out without any danger of spilling over. The smooth sanitary, washable cup is molded by The Brittain Products Co., 2475 Second St., Cuyahoga Falls, Ohio

For those who pray the Rosary, a new, lightweight Recorder molded of Tenite II cellulose acetate butyrate incorporates both a Rosary and a pointing device housed in a compact clear-topped case. By depressing a plunger, the user actuates a dial which points to the bead being prayed. On the dial face, the Mysteries are lettered in color. The Recorder is molded by St. Cloud Tool and Die Co., 540 33 Ave., North, St. Cloud, Minn. for Queen of the Rosary Foundation, St. Cloud, Minn.

Recipes and household hints can be filed for quick, ready reference in a smartly designed recipe box molded of lustrous styrene. The hinged cover of the file flips open easily to provide access to the alphabetically indexed 3 by 5 in. cards. Food stains can be easily wiped off the smooth surface of the box and it will not rust, chip, tarnish, dent, corrode, or peel. Available with white cover and colored bottom from Columbus Plastic Products, Inc., 1625 West Mound St., Columbus 4, Ohio

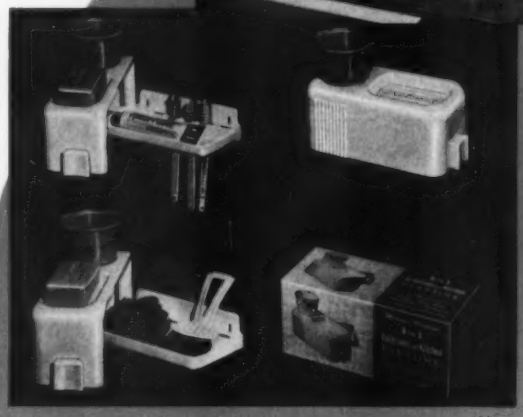
PRODUCTS

For bicycling enthusiasts—young or old—a colorful, whirling ornamental device, molded of sturdy high-impact styrene, can be attached to handle or body frame. For safety precaution at night, reflectors set into the three whirling hemispherical sections of the ornament give off a flickering light to oncoming traffic. The Whirl-flector is manufactured by Gladen Enterprises, Inc., 3573 Kawkawlin Rd., Bay City, Mich.

Heat-resistant, flame-resistant spoon rest, molded of Melmac melamine, can be placed without danger on stove or oven. The smartly-designed, non-breakable rest, when not in use for cooking utensils, is attractive enough to double as a convenient tray for snack servings. The Handi-Tray unit can be had in yellow, blue, or green to match pastel dishware colors. It is made by Northwest Plastics, Inc., 65 Plato Ave., St. Paul, Minn.

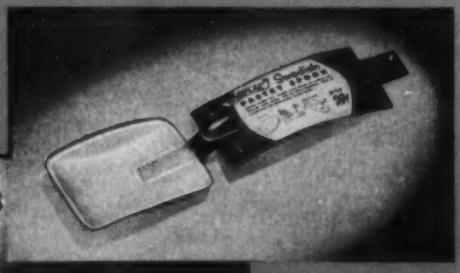
Interesting and unique effects for portrait or commercial photography can be accomplished with a vignetter kit, containing four completely different outlines molded of mottled Lustrex styrene. The durable outlines are lightweight to hold and are easy for the user to keep clean. Outlines are molded by Rona Plastics, Inc., 1525 Blondell Ave., Bronx 61, N. Y. for the E-Z vignetter kit distributed by Abemar Products Co., 505 Fifth Ave., New York 17, N. Y.

A solution to a perennial storage problem in bathroom or kitchen is offered by a molded styrene fixture which screws onto the wall. The top surface of the unit provides a place for soap and a tumbler, while the front part swings out to reveal a shelf where toothbrushes and paste or kitchen scouring aids may be stored. It is made by J & S Mfg. Co., 2517 S. Michigan Ave., Chicago 16, Ill.

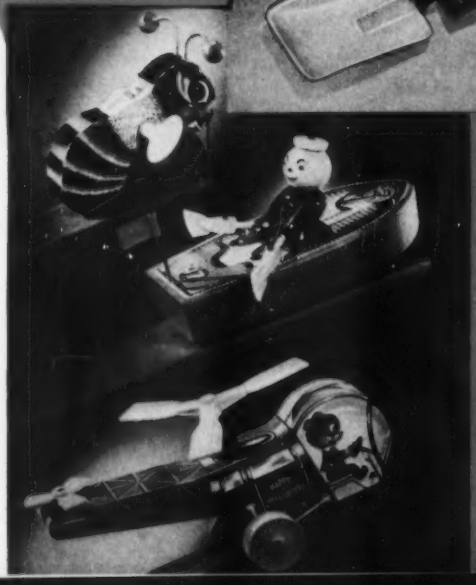


PLASTICS

Durability and functional utility characterize the combination of polyethylene and styrene in a Swedish pastry spoon. The square-shaped spoon is molded in tough, clear polyethylene; the bright red or yellow handle is Lustrex styrene. The flexible, easy-to-use spoon will not collect the ingredients during mixing. Molded by Northwest Plastics, Inc., 65 Plato Ave., St. Paul, Minn.



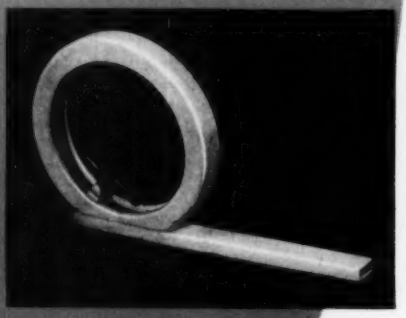
Contributing to the sturdy construction of a series of colored pull toys are various movable parts—the wings of a bee, the blades of a helicopter, the arms of a rowing sailor, and oars—all molded of shatterproof Tenite I cellulose acetate. The parts are molded by Trimold, Inc., 1011 Military Rd., Kenmore 17, N. Y. for Fisher-Price Toys, Inc., East Aurora, Erie County N. Y.



Vinyl shields are an effective method of toning down intense sun glare through windows and providing thermal insulation. The tough, flame-resistant covering can be permanently secured to a window by merely pressing it against the wet glass and may just as easily be removed. Available in various colors from Filterzone Autovision Co., 641 Lexington Ave., Brooklyn, N. Y.

Handy coaster-handle, molded of durable styrene, provides ease in handling glasses and beer cans and reduces the danger of spilled drinks. The glass rests on the coaster base of the unit and is held securely in place by a notched spring-loaded projection at the upper end of the handle. Handles are molded in bright colors by Coast To Coast Products. P. O. Box 58, Ludlow, Mass.

PRODUCTS



The traditional childrens' whistle has been dressed up into a colorful styrene action toy. When the child blows into the mouthpiece of the circular-shaped whistle, a model styrene airplane or automobile, both of which are interchangeable, is forced by the breath to travel in a loop around the circle. Tooter Looper is made by Elmar Products Co., 15 West 24 St., New York 10, N. Y.

Smart, colorful utility bags are covered with a bright plaid, 20-gage vinyl that resists scuffing and fading. The lining, which may be pulled out for cleaning, is also vinyl so as to make the bag waterproof inside as well as outside. To safeguard against ripped seams, electronic seam sealing is used. Four different sizes—adaptable as purse, beach, knitting, lunch, or travel bag—are made by Catchall Crafts, Inc., 3120 Champman St., Oakland 1, Calif.

Techniques of Vacuum Forming†

Fast cycles of new method, plus ease of decoration, offer competition to molding, with main limitations imposed by piece design

by R. L. Butzko††

Courtesy Noma Electric Corp.

One of the newest examples of products fabricated by vacuum forming, in which the sheet to be formed is heated on the mold, is this Santa Claus figure produced from a single 32- by 60-in. sheet of 0.040-in. hard vinyl. The 58-in. high figure weighs 4 pounds

THE process which has now come to be known as Vacuum Forming and which consists of drawing a heat-softened thermoplastic sheet into a mold by pulling a vacuum differs from previously used methods in that the sheet is heated in position on the mold, whereas most other methods involve heating the sheet apart from the mold and then transferring the softened sheet to the mold where forming takes place.

This newer technique has greatly simplified forming operations and, at the same time, has greatly reduced the time required to produce a finished piece. Vacuum forming, with overall cycle times as low as 30 sec., has taken its place along other high-speed plastics molding operations. With continuing improvements in heater design, mold cooling, and handling methods, there is little doubt that cycle times will come down to as low as 15 seconds.

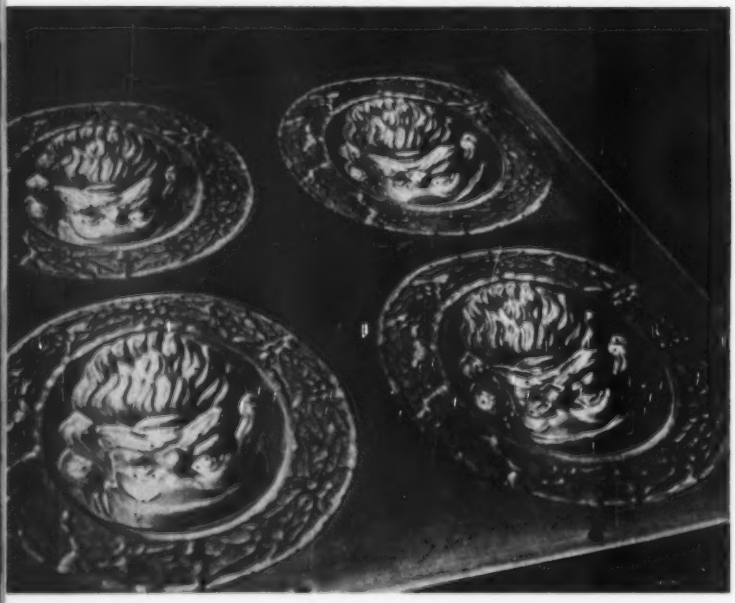
Can vacuum forming compete with injection molding? The answer is a qualified "yes"; the qualification involves limitations of piece design. Some parts being injection molded today can be vacuum formed at lower piece prices and at much lower mold costs. Of course, many items with complicated interiors or requiring molded-in inserts cannot be vacuum formed. In general, however, this new method is creating an entire new field of plastics applications which, because of thinness of wall section or the economic deterrent of high mold

* Reg. U. S. Pat. Off.
† This article is based on a paper given at the Ninth S.P.E. Conference.
†† Auto-Vac Co., Fairfield, Conn.

Photos this page courtesy Nomo Electric Corp.

In producing a sprayed metal mold for use in vacuum forming, particles of molten metal are projected onto a master to build up a metal shell with thickness of 1/8 to 5/16 inch

Close-up of finished sprayed metal mold, after backing up and drilling of vacuum holes. In some molds, pins placed in the master are later removed to produce the vacuum holes



costs, could not be produced by injection.

A leading custom injection molder recently stated that only one out of every five jobs his company estimates on results in a production run. He claimed that the other jobs, which either were never produced or were made of a material other than plastics, were lost because of either too high tooling cost, too long tooling period, too low a rate of production, or too high piece cost. He further stated that out of every four jobs on which his company was unsuccessful in bidding, at least one would have been made of plastics if vacuum forming was the production method used in estimating.

Cost and Time Factors

Even though the sheet material which is used for vacuum forming costs from 1½ to 2½ times that of molding powder, vacuum formed pieces can be produced on a very favorable economic basis, since sheet material is generally stronger and therefore very thin wall sections may be used. Wall thicknesses of 0.010 to 0.030 in. are common in vacuum forming whereas the same piece designed for injection molding would demand wall thicknesses of 0.060 to 0.090 in. minimum.

One great advantage of the vacuum forming method is that it makes possible multi-color decoration at very low cost, since the decorating can be done on the flat sheet before it is formed. In this process, coloring is applied to the flat sheet in a distorted design such that when the sheet is drawn to shape, the colors will accurately fall into their assigned places.

Colors are applied to the flat sheet by either silk screening or printing by one of the various printing processes, of which lithography is most commonly used. An area as great as 8 to 10 sq. ft. can be precolored at one time in as many colors as required and then vacuum drawn. Molds with numerous cavities can be used to form sheets of this size and the individual pieces die cut, thus producing many parts per cycle of the machine.

Silk screen costs are approximately as follows: Screens, $20 to $40 per color for a sheet 20 by 25 inches; screening, $0.03 per color for same sheet size; paints, $7 to $12 per gal. or about $0.01 per sq. foot.

Melmac holders are molded for Dixie Cup Company by Northern Industrial Chemical Co. and Prolon Division of Prophylactic Brush Co. Approved by U. S. Testing Co.

announcing...

colorful new DIXIE* holders molded of Melmac®

Wanted by Dixie: a thermosetting plastic which would combine the following properties: heat resistance, permanent color, low moisture absorption, long-lasting gloss and resistance to breakage—all at a reasonable price. The phenomenal success of heavy-duty dinnerware made of Melmac molding material suggested the answer . . . and exhaustive comparison testing confirmed it.

Melmac proved completely successful: The new Melmac holders are as practical behind the counter as they are beautiful on it. Available now in three colors—buff, blue and grey—they fit all cone-shaped Dixie Cups and Dishes. They're color-fast—because the color is *molded in*, part of the material itself. They're chip and break resistant. They're burn-proof, light, strong, quiet, odorless, easy to handle and easy to stack. They dry without polishing. And they're economical to mold.

These exceptional properties are a few of the reasons why more and more food service accessories are now being molded of Melmac. Write today for complete information and successful case histories.

**Dixie is the registered trade mark of Dixie Cup Company, Easton, Pa.*

Dixie holders carry this insignia, indicating that they comply with the high standards of quality established for heavy-duty melamine dinnerware by industry through the U. S. Department of Commerce.

AMERICAN Cyanamid COMPANY

PLASTICS DEPARTMENT

32 Rockefeller Plaza, New York 20, N. Y.

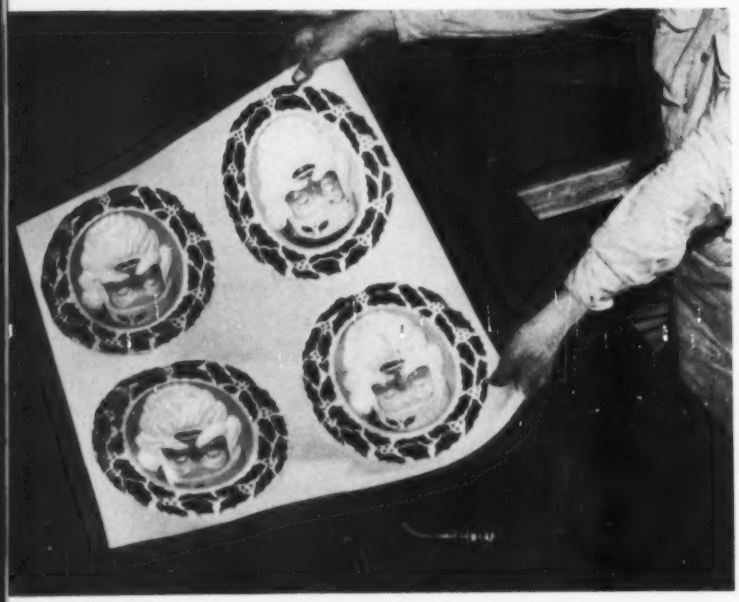
Chicago • Cleveland • Dallas • Los Angeles

In Canada: North American Cyanamid Limited
Royal Bank Building, Toronto, Canada

Photos this page courtesy Noma Electric Corp.

One big advantage of vacuum forming is that decoration can be applied to the flat sheet in distortion (foreground) and will fall into place after sheet is formed (background)

Close-up of formed sheet as it is removed from the vacuum forming mold shows the three-dimensional colored detail that is obtainable from distortion-printed flat sheet



Paints must be selected which have good adhering qualities and which will stretch 100% without breaking or changing color appreciably.

Printing requires longer runs than silk screening to prove economical since 8 sq. ft. plates run from $75 to $200 per color. In general, the plastic sheet size is controlled by the size of the printing presses which are available.

A full sheet of 8 sq. ft. costs about $0.04 per color to run on a litho press; a run of 7500 to 10,000 sheets minimum is necessary to bring overall costs within reason.

Printing inks, because of their fast drying requirement, do not have the good adhesion of silk screen paint and require an overcoating to prevent the color from rubbing off. They are also sometimes too thin for products which are to be illuminated from within and require double printing to obtain sufficient color depth.

Even the most complicated molds for vacuum forming are relatively inexpensive since the majority of them are either made of treated plaster or are reinforced sprayed-metal or electro-formed shells.

Machines for vacuum forming are figured in platen area and maximum depth of draw, with the latter figure being limited only by the vacuum tank size, the vacuum pump size, and the degree of vacuum attainable.

Plaster and Metal Molds

Plaster molds are made of the harder plasters such as U. S. Gypsum's Hydrocal or Certainteed Products' Densite. These plasters are usually reinforced with screening. The cost of such molds is about $30 to $40 per sq. ft. exclusive of master cast, with about $20 per sq. ft. additional cost for a clamping frame.

When the plaster mold has been cast it is impregnated with a resin such as Bakelite's C8 epoxy. By this method, excellent molds with hard durable surfaces are produced. In fact, certain large plaster molds are still in operation after having produced over 50,000 pieces.

Sprayed metal molds are practically permanent molds; many of this type now in service have produced 500,000 pieces and are still in good shape. Such molds are made by

Large sheets of plastics can be vacuum formed and subsequently die cut into individual pieces, thus giving high piece production per cycle of the vacuum forming machine. At left, a clicker is being used to die-cut Santa Claus heads from a sheet formed in a four-cavity mold. Sprayed mold and molding steps are shown on previous pages

Courtesy Noma Elect. Corp.

Below: A two-unit vacuum molding machine with 30- by 50-in. moldable area for each table. Overall size is 9 ft. long, 7 ft. wide, and 6 ft. high. Vacuum pump has 5 hp. motor; tank has capacity of 350 gal.; valves are 3 inch

Courtesy Auto-Vac Co.

spraying hot metal particles on a master and building a durable shell having a thickness of ⅛ to 5/16 inch. This shell, backed up to strengthen the assembly against the shock of vacuum forming, is then drilled with vacuum holes and is ready for use. Approximate costs are as follows: spraying, $75 per sq. ft.; backing up, $15 per sq. ft.; clamping frame, $20 per sq. ft.

Mold masters are prepared of plastic, wood, plaster, or rubber. For best results the masters must be carefully prepared and all undercuts and surface defects eliminated since the sprayed metal reproduces every minute detail. A fine sand blasting or matting of the master surface is desirable to insure adherence of the sprayed metal. A good silicone parting agent is then carefully wiped on to the master.

For the best mold, a low shrinkage lead compound is first sprayed on the master to a thickness of approximately 0.005 to 0.020 inch. This is then backed up by many coats of a bronze compound until the shell has reached a thickness of ⅛ to 5/16 in., according to the area of the mold. Larger molds, of course, require thicker walls. Other metals such as tin, aluminum, zinc, and copper are used with good results in vacuum molds.

After spraying, the shell is removed from the master and backed up for additional support. Plaster backing works very well and lasts the life of the mold. A backing of resin and fibrous glass is also very good and makes the mold much lighter. In some types of molds requiring many vacuum holes, pins are pushed into the master before spraying and are pulled out after spraying and backing. This eliminates the drilling of many tiny vacuum holes.

Molding

The molding operation consists of placing the plain or preprinted sheet of material, cut to proper size, over the mold. A clamping ring is then lowered into place and totally clamped so that air cannot leak between the thermoplastic sheet and the top surface of the mold. The heater element is then pulled into position over the sheet. After a predetermined length of heating time has elapsed, the valve to the vacuum pump or chamber is turned on. Pulling the vacuum causes the softened sheet to be forced into the mold by atmospheric pressure pressing on the outer surface of the sheet. After a short cooling period, the clamping ring is removed and the formed sheet taken out of the mold.

Timing of vacuum molding depends upon the thickness of the material used. In general, the following data can be used for the heating cycle:

Hard vinyl
7 sec. per 0.010 in. of thickness
Flex. vinyl
12 sec. per 0.010 in. of thickness
Acetate
13 sec. per 0.010 in. of thickness
Styrene copolymer
8 sec. per 0.010 in. of thickness
Butyrate
10 sec. per 0.010 in. of thickness

The above results were obtained using a 700° F. heater approximately 2 in. from the sheet.

Overall forming cycles are approximately as follows:

On gages from 0.010 to 0.030 in., 1½ cycles per minute
On gages from 0.030 to 0.040 in., 1 cycle per minute
On gages from 0.050 to 0.080 in., 30 to 40 cycles per hour

Usually both the heating and cooling cycles are accurately timed to give greater product uniformity.

Die Cutting

Cutting out the formed pieces from the sheet is accomplished with dinking machines, clickers, or crank presses and the use of high dies.

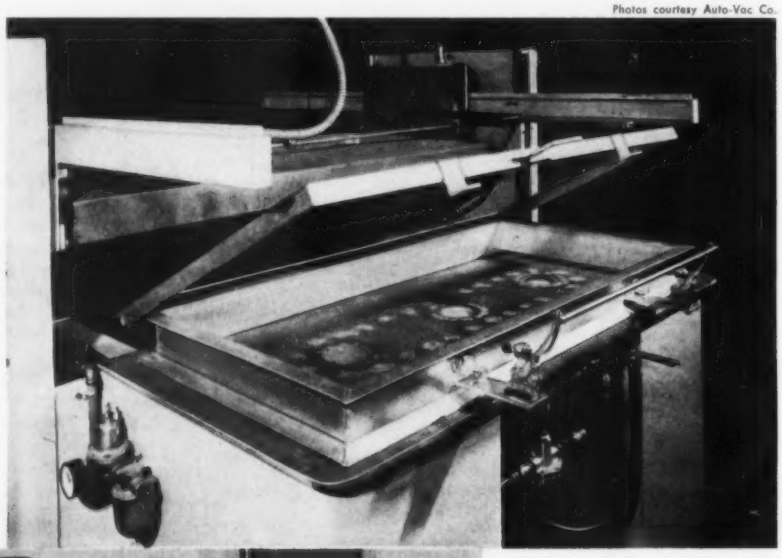
A clicker is a machine having a bed of wood, soft metal, or rubber upon which the material is placed. A high die is placed atop the work and a swinging head is pulled over the die. A quick short stroke of about 1 in. is imparted to the die, forcing it through the work. The head is then swung out of the way and the pieces removed. A dinking machine works on the same principle except the head does not swing; the work and die are slid under the head. Usually several pieces are stacked and cut at the same time.

Clickers cost about $600 for a machine with a 12-in. head and up to $1200 for one with a 24-in. head. A 36-in. piece may be cut on a 24-in. head with 2 strokes.

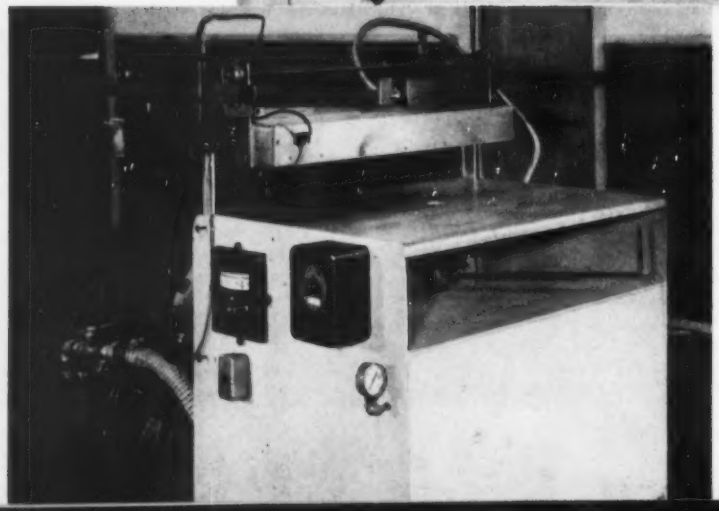
Dinkers are about 26 by 50 in. and cost about $3000.

Dies cost from $75 to $300 and will last for hundreds of thousands of pieces. Parts having an area of about 1 sq. ft. average can be cut at a rate of from 1000 to 1500 pieces per hour in thin gages.

Photos courtesy Auto-Vac Co.



Right: Close-up of mold base of 24- by 50-in. vacuum molding machine with mold clamp open. Over-all size of unit is 8 ft. long, 7 ft. wide, and 6 ft. high. Valves are 3 in. in diameter; pump is 5 hp.; vacuum tank is 350 gallons



Left: Single-unit vacuum molding machine. Moldable area is 21 by 25 in.; over-all table size is 30 by 51 in.; table height is 33 inches. Vacuum is produced by a 2-hp. pump; tank has capacity of 60 gallons

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of Her Gracious Majesty
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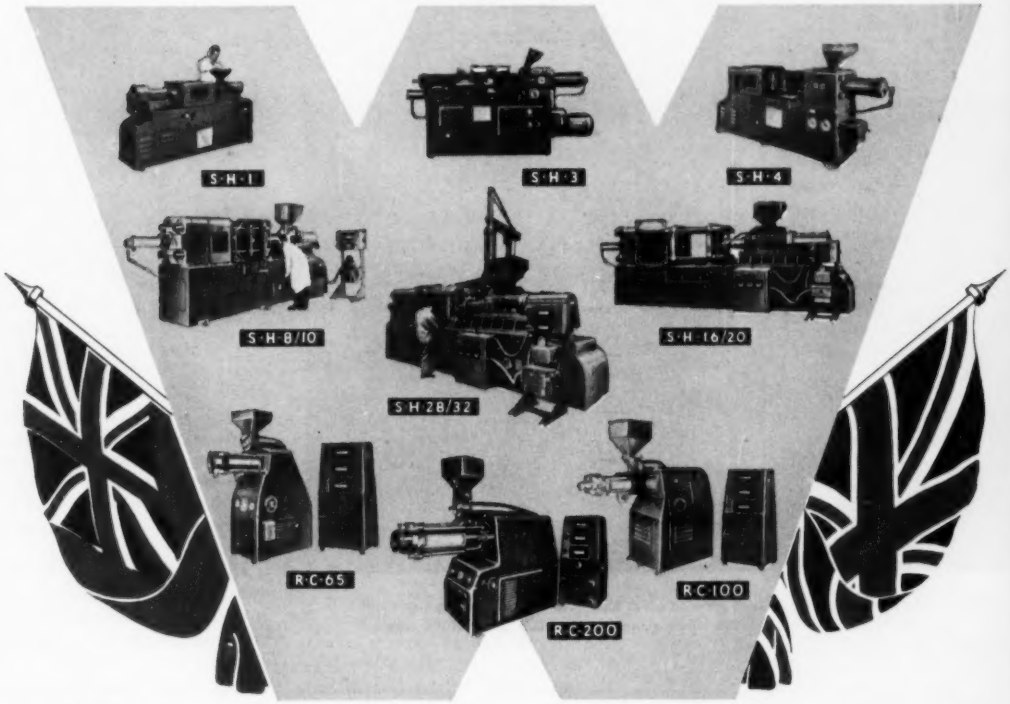

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BRITISH PLASTICS EXHIBITION, Olympia, London, England. 8th to 18th June. Stand No. A21/A22.

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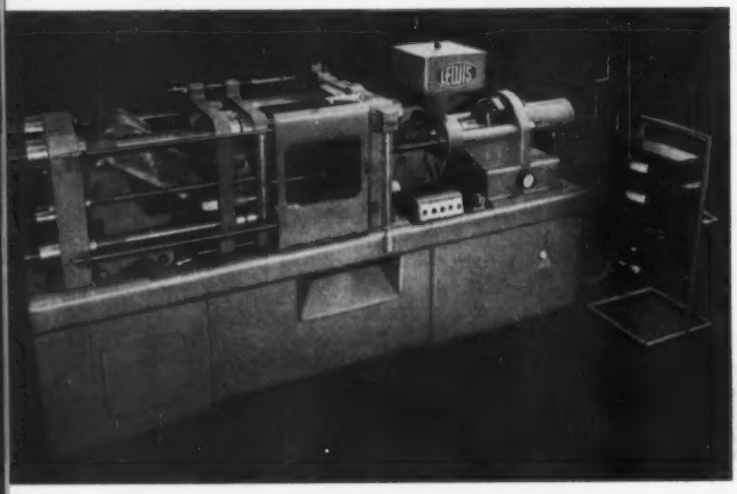
New Machine has Dual Clamp

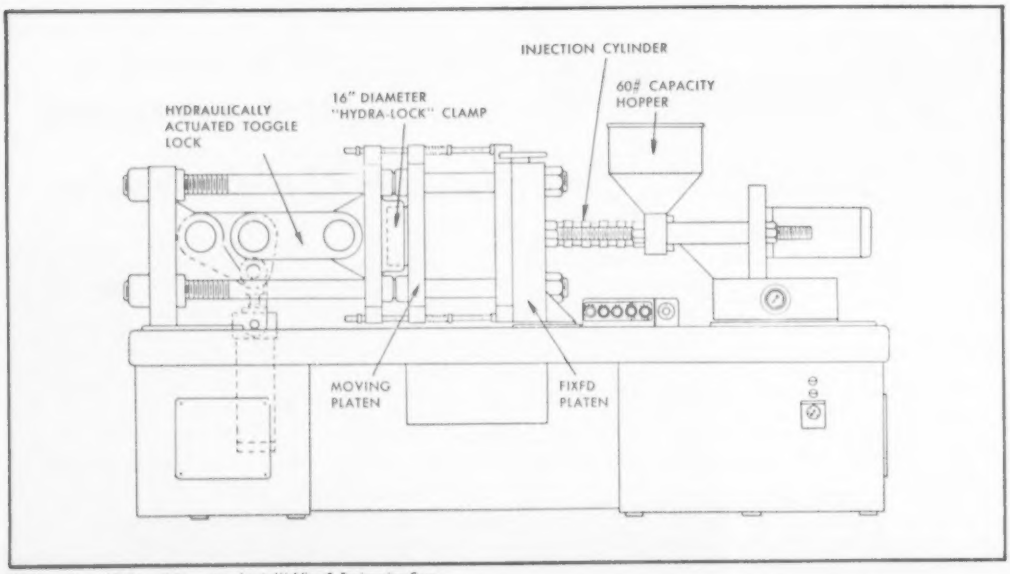
Toggle mechanism serves as mechanical locking device; hydraulic cylinder supplies final clamping pressure



Complete set-up of new injection machine which incorporates ingenious toggle mechanism with hydraulic clamp. Multiple injection strokes reduce bulk factor of the material

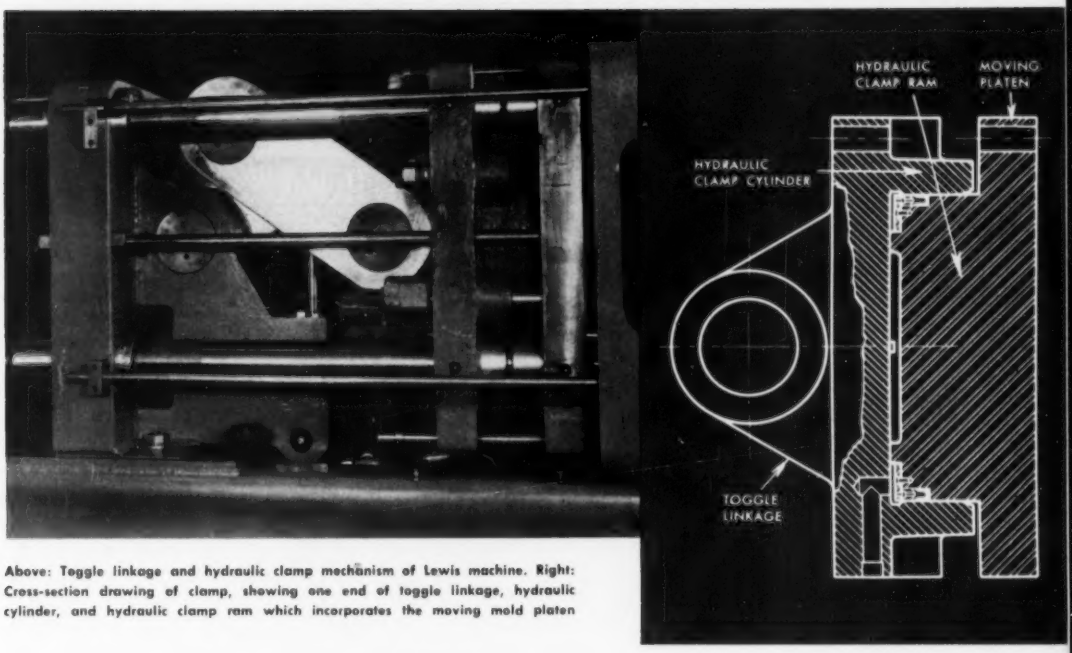
A DESIGN and development program undertaken by Lewis Welding & Engineering Corp., Bedford, Ohio, was aimed at producing an injection machine which would be simple and easy to operate; which would have sufficiently high injection pressures to produce sound, sharp moldings without flow lines or weld marks; and which would have sufficient clamping strength to confine the plastic material in the molds under this high pressure without flashing. Speed of operation, inherent strength of the various machine elements, minimum space requirements, and low operating costs were all parts of the program. All the problems have been solved and several machines have been built and are in operation.

The new machine employs a straight bore, externally heated injection cylinder. The plastic material enters by gravity and is packed into



All illustrations with this article courtesy Lewis Welding & Engineering Corp.

Schematic drawing shows relationship of parts of injection machine. Toggle linkage is at left; hydraulic cylinder in center takes over after toggle locks, closing mold and giving final clamp. Injection cylinder is straight bored



Above: Toggle linkage and hydraulic clamp mechanism of Lewis machine. Right: Cross-section drawing of clamp, showing one end of toggle linkage, hydraulic cylinder, and hydraulic clamp ram which incorporates the moving mold platen

the heating section by multiple injection strokes. This pre-packing serves to compress the material, thus reducing the bulk factor, and insures maximum injection of the plasticized material.

The injection of material into the mold is compensated electrically. By proper adjustment of the control circuits, the machine is set so that the heating chamber is starved by a small amount on each stroke. The injection plunger therefore advances a little farther with each stroke until it strikes a limit switch. It is then returned to a point of maximum retraction and the process of progressive starving starts again. The machine thus completes its feed and injection operations in compensated balance.

Injection pressures are readily adjustable from practically 0 to a maximum of 20,000 p.s.i. In special cases, this can be increased to 30,000 p.s.i. by reducing the diameter of the injection plunger.

Clamping System

A basically new type of clamping system is incorporated in the machine. Called the "Hydra-Lock," this mechanism is believed by the manufacturer to be one of the most important mechanical contributions to the art of molding in many years.

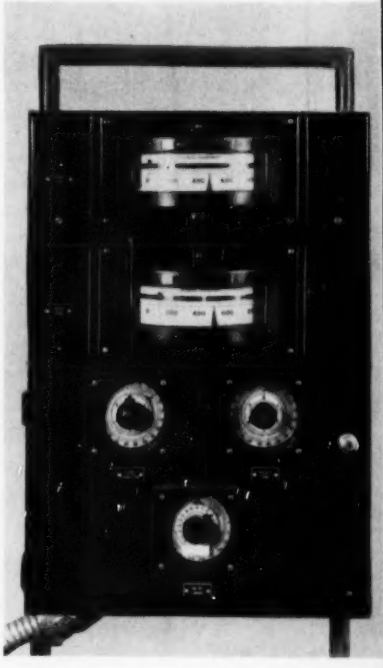
The clamping mechanism of the machine embodies three principal elements. A toggle linkage advances the platen, on which the moving half of the mold is mounted, to a position wherein the mold faces are open only a fraction of an inch, at which point the toggle is locked. Incorporated in the platen structure is a 16-in. diameter hydraulic cylinder, actuated automatically through the control circuits, which does the final closing of the molds and supplies the final clamping pressure. The toggle mechanism serves as a mechanical locking device to hold the platen in the closed position.

The stroke of the large cylinder is so short that only a fraction of a gallon of oil and a few tenths of a second are required for the hydraulic portion of the clamping cycle.

The high pressure thus developed is necessary to resist the high injection pressures which the machine can develop.

The design of the Hydra-Lock clamping system makes available to the operator an easy mold setting

(*Continued on p. 114*)



Instrument panel for injection machine has heat controls and cycle timers

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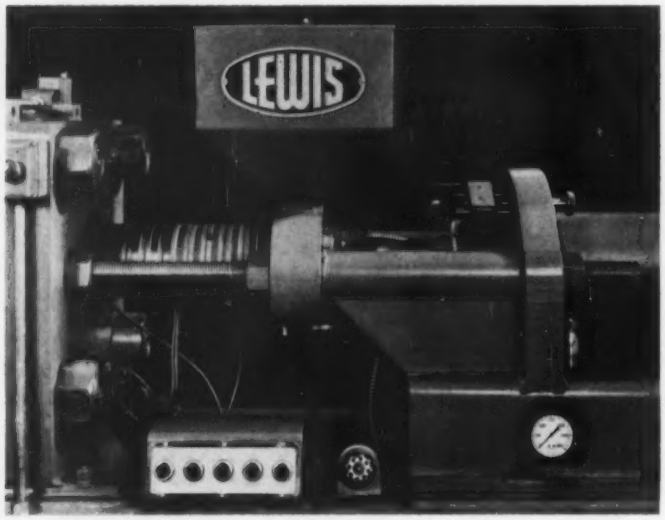
procedure. The short stroke of the clamping cylinder and the liberal clearances in the guides permit quick line-up of the mold faces. The machine will tolerate considerable misalignment of the mold faces but still close and give uniform bearing across the mold. The action of the clamping cylinder is such as to provide essentially ball-and-socket action within reasonably close limits.

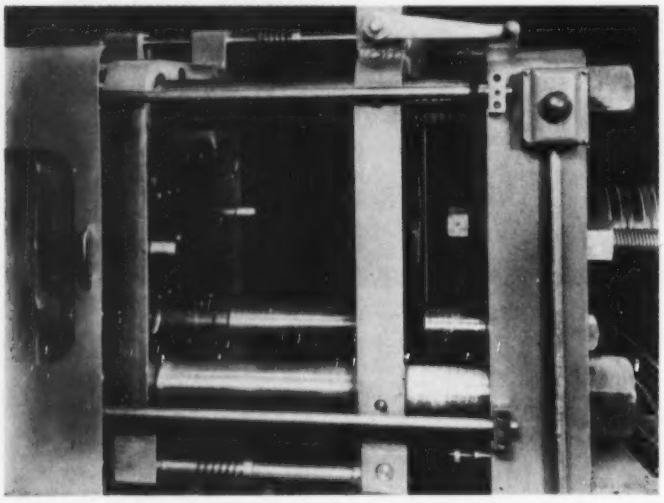
The molding cycle is started by closing the safety gate. Thereafter the platens are automatically advanced, the Hydra-Lock cylinder closes the mold, and the material is injected. Pre-packing of the injection cylinder takes place during the cooling portion of the cycle, so there is no loss of time in the overall cycle.

All of these operations are controlled automatically, but each element of the cycle can be adjusted to suit the mold in use.

The actual rating of the capacity of the machine is a matter which is determined to a large degree by the molds. The injection cylinder has a plasticizing capacity of 60 lb. of styrene per hour and shots weighing 6.8 oz. have been molded satisfactorily at the rate of 2½ shots per minute.



Hopper and injection cylinder of new machine incorporating dual clamp, showing the operating controls. Pre-packing takes place during cooling part of the molding cycle



Mold setting procedure is simplified by the short stroke of the hydraulic clamping cylinder and liberal clearance in the guides. Clamp gives ball-and-socket action

Specifications For Lewis Injection Machine

Plasticizing capacity per hr. (lb.)	60
Capacity of hopper (lb.)	60
Diameter of injection plunger	2 in.
Stroke of injection plunger	8 in.
Heating cylinder (total watts)	13,000
Number of injection strain rods	2
Diameter of injection strain rods	2 in.
Mold clamping pressure (tons)	200
Mold thickness (maximum)	12 in.
Mold thickness (minimum)	6 in.
Mold opening (stroke—maximum)	12 in.
Size of platen and die plate	24 by 24 in.
Number of clamp strain rods	4
Diameter of clamp strain rods	3¼ in.
Distance between strain rods (vertical)	18 in.
Distance between strain rods (horizontal)	18 in.
Hydraulic system operating pressure (p.s.i.)	2000
Motor horsepower	20
Motor speed, 60 cycle (r.p.m.)	1200
Motor speed, 50 cycle (r.p.m.)	1000
Hydraulic oil required (gal.)	100
Overall length	11 ft., 1 in.
Overall width	36 in.
Overall height	5 ft., 9 in.
Weight (approximately)	8000 lb.

Experience Brings Improvements

Five refinements engineered into twin-screw extruder have increased efficiency and simplified operation

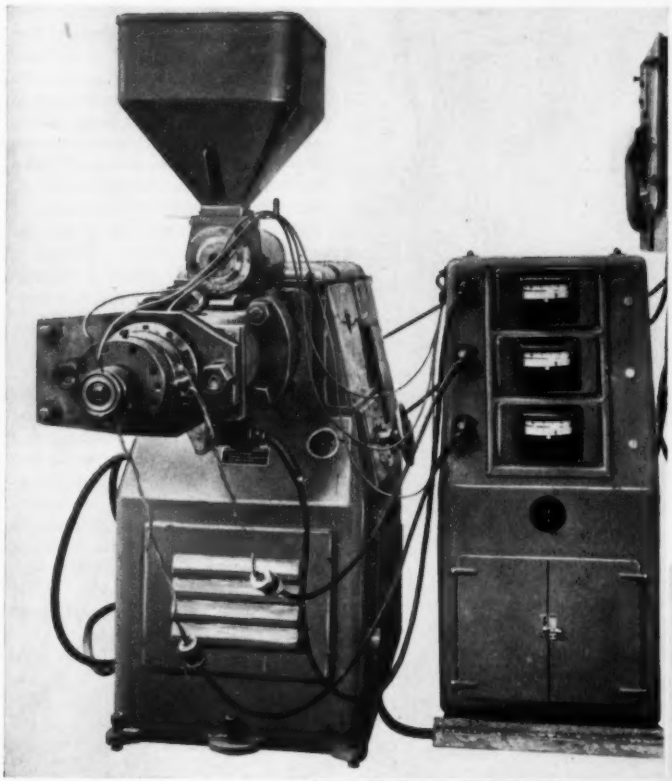


Fig. 1—Over-all view of redesigned extruder in which have been incorporated a number of improvements based on experience. For example, an increase in thrust washer area makes possible higher extrusion rates without overloading

DURING the past year, experience gained from the large number of installations of RC-100 Stokes-Windsor extruders has resulted in five major machine improvements, which have been engineered co-operatively by the F. J. Stokes Machine Co., Philadelphia, Pa., and the manufacturer, R. H. Windsor Ltd., Surrey, Eng.

Basically these five improvements are: 1) an increase in thrust washer area; 2) the development of a clutch mechanism on the feeder assembly; 3) the use of a spline on the drive end of the screws; 4) the elimination of tie rods; and 5) the development of a hinged adapter plate assembly.

The increase in the thrust washer area gives approximately a 50% greater thrust area which in turn results in increased extrusion rates without overloading the equipment.

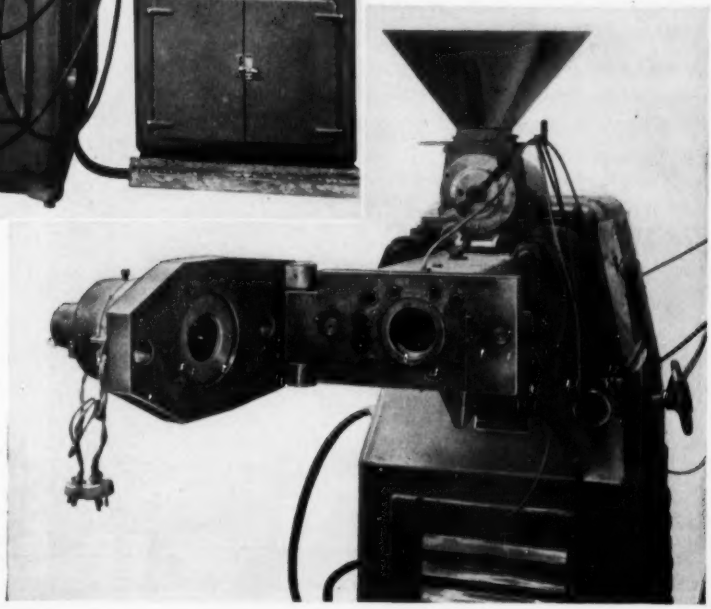
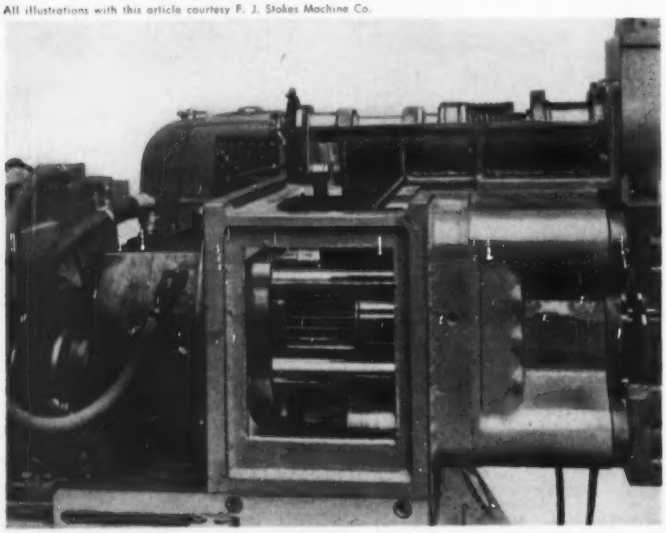


Fig. 2—Hinged adapter plate open, showing the 12 ring bolts used to assemble plate to barrel. In this view, screen pack has been removed

Fig. 3—With barrel clamps open, chain hoist hooked to eye bolt can remove barrel

Fig. 4—Upper center: spring loaded clutch mechanism on extruder feeder assembly

All illustrations with this article courtesy F. J. Stokes Machine Co.



The clutch mechanism on the feeder assembly is a safety device which acts to protect the ratchet wheel, pawl, and other driving members, in case large particles of plastic or other foreign materials should temporarily jam the feeder boat assembly. The use of splines instead of gears on the drive end of the screws makes it possible to remove the screws without any disassembly of the thrust block assembly.

The elimination of the tie rods aided greatly in designing the hinged adapter plastic assembly. The barrel is now supported by an easily disassembled swinging bracket mounting which makes it possible to disassemble the barrel for cleaning purposes in a matter of two minutes. The hinged adapter plate with one section ring bolted to the barrel itself has eliminated the problem of leakage between the barrel and the adapter plate. Another advantage is that this assembly makes it possible to replace the screen pack in a matter of seconds.

Ease of Cleaning

One of the most important advantages which has been gained through these improvements, according to the manufacturer, is that this machine may be completely disassembled, cleaned, and re-assembled in 10 min. when vinyl material is being extruded. This cleaning time is increased somewhat with materials other than vinyls.

An overall view of the redesigned extruder is shown in Fig. 1.

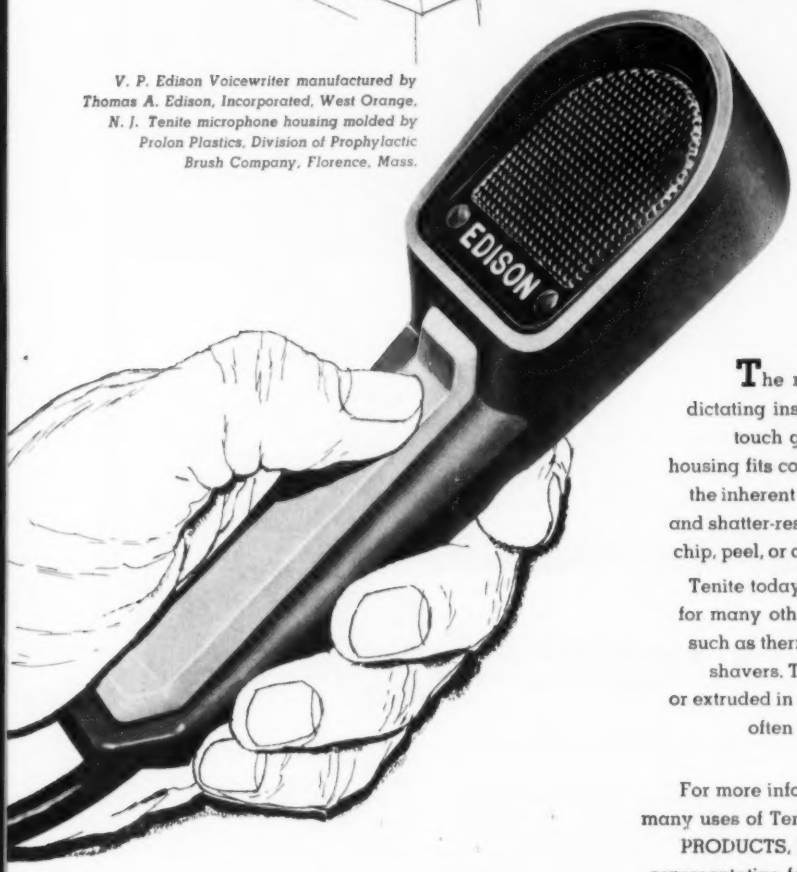
In Fig. 2, the hinged adapter plate is opened and the screen pack has been removed. The 12 ring bolts used to assemble one section of the adapter plate to the barrel are clearly shown.

One of the swinging bracket barrel clamps is shown in the open or swing-away position in Fig. 3. With the other clamp opened and a chain hoist hooked to the eye bolt in the top of the barrel, the barrel can be quickly disassembled from the worms in a matter of seconds.

The spring loaded clutch mechanism on the feeder assembly is shown at upper center in Fig. 4. The splined ends of the worms are shown in the center of this photograph. In operation, a transparent cover protects this driving mechanism yet makes it possible for the operator to inspect the area.

sound housing

V. P. Edison Voicewriter manufactured by Thomas A. Edison, Incorporated, West Orange, N. J. Tenite microphone housing molded by Prolon Plastics, Division of Prophylactic Brush Company, Florence, Mass.



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PLASTICS*
TECHNICAL SECTION: Dr. Gordon M. Kline, Technical Editor

Polystyrene Monofilaments and Bristles

Relationships Between Fabrication Variables and Properties

by K. J. Cleereman† H. J. Karam† and J. L. Williams†

This paper discusses the fabricating variables that must be considered in the production of oriented polystyrene monofilament. The effects of fabricating variables on physical properties, orientation, and shrinkage are evaluated. On the basis of this investigation, conclusions are formulated as to the proper technique to use in the production of polystyrene monofilament.

A STUDY has been made to determine the proper technique for fabrication of oriented polystyrene monofilaments. The primary purpose of this study was to determine the fabricating factors that affect the physical properties of oriented monofilaments. To facilitate this study, a monofilament orientation unit has been designed which makes possible the fabrication of monofilament over a wide range of operating conditions.

Figure 1 is a sketch of the monofilament orientation apparatus used in this investigation. The strand enters the orientation unit at bath B_1 from the extruder on the left. This bath is maintained at a controlled constant temperature which can be varied over a wide range. The purpose of this bath is to bring the extruded strand to some desired temperature prior to stretching. In the range of orientation temperature, the polystyrene strand is rubbery and incapable of supporting itself. The idler rolls which are situated in bath B_1 serve to support the strand until temperature equilibrium is attained.

After passing the idler rolls, the strand travels around the snubbing rolls (R_1). This set of rolls controls the rate of stretching of the strand and restrains it while being stretched. The speeds of the idler rolls and snubbing rolls (R_1) are identical. The speed of R_1 is adjustable over a wide range, thus enabling studies at different rates.

From the snubbing rolls, R_1, the strand travels to rolls R_2 which are situated in bath B_2. Baths B_1 and B_2 are connected by a narrow slot.

* Reg. U.S. Pat. Off.
† Styron Inspection and Service Laboratory, The Dow Chemical Co.

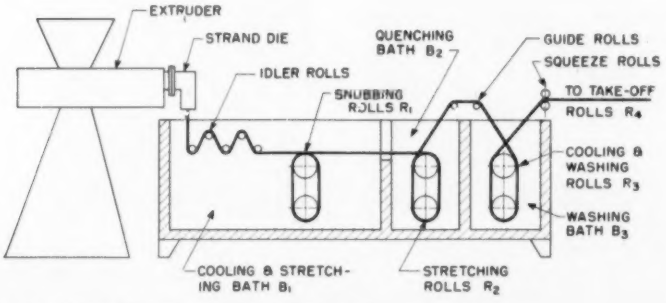


Fig. 1—Orientation unit for polystyrene monofilament

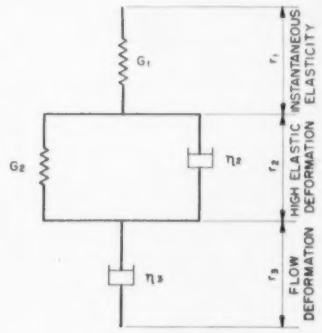


Fig. 2—Mechanical model of deformation equation

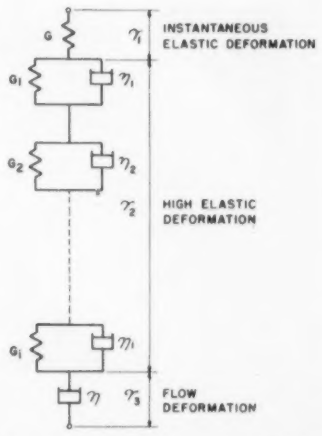


Fig. 3—Model of polymer represented by continuous distribution of retardation time

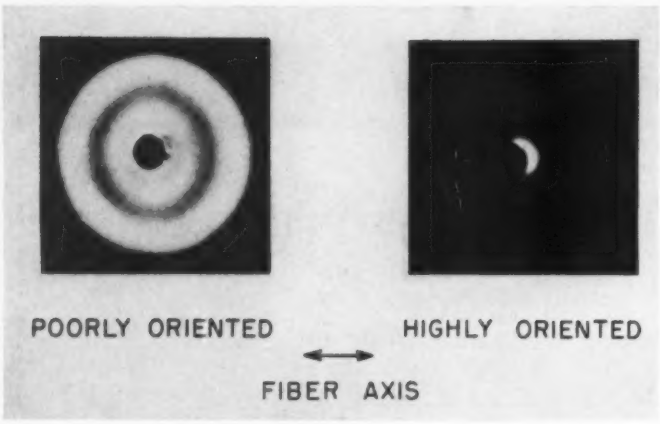


Fig. 4—X-ray diffraction of polystyrene monofilaments

The temperature of the two baths can be regulated independently. By adjusting the temperature of bath B_2, one can control the quenching rate of the strand after it has been hot-stretched.

Stretching of the strand is done between rolls R_1 and R_2. The speed of R_2 is adjustable, thus enabling a wide range of stretch ratios to be used in fabricating monofilament. The monofilaments are stretched in a liquid bath primarily because of the ease in controlling and establishing temperature equilibrium. From the stretching rolls R_2 the strand travels around a set of guide rolls into a final cooling and washing bath. The temperature of the bath B_3 and the speed of rolls R_3 are also adjustable over a wide range.

Definitions

The following terms as defined will be used in all subsequent discussion:

Percent hot stretch is the amount of linear relative elongation given a monofilament between rolls R_1 and R_2.

$$= \frac{\Delta L}{L} 100 = \frac{\text{rpm } R_2 - \text{rpm } R_1}{\text{rpm } R_1} 100$$

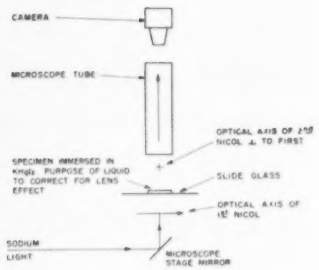


Fig. 5—Polarizing microscope set-up for obtaining birefringence data

Rate of stretch is the rate at which the monofilament is stretched, expressed as percent per unit time.

$$= \frac{\% \text{ Stretch} \times \text{Output (ft./min.)}}{\text{Distance between } R_1 \text{ and } R_2}$$

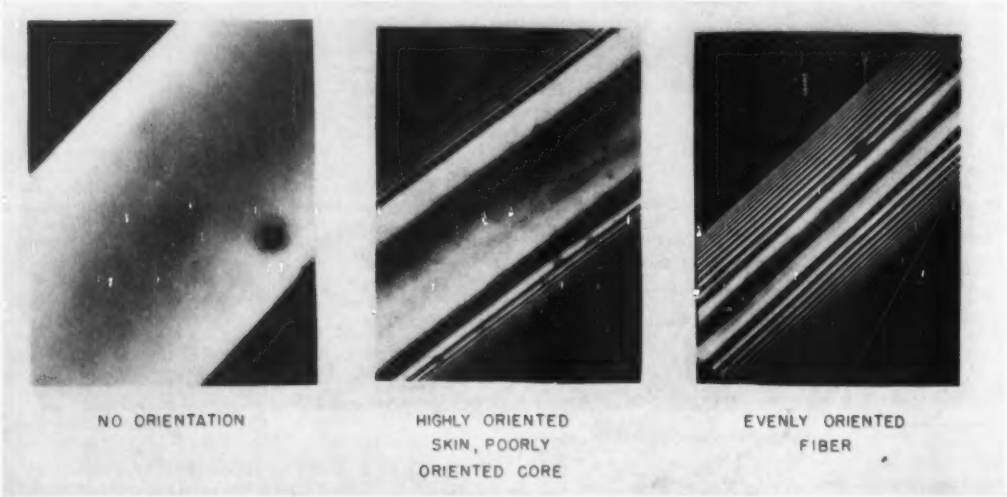
At any constant stretch ratio, the rate of stretch can also be defined by the speed of R_1, the snubbing rolls controlling rate of stretch.

Rate of quench is the rate at which a monofilament is cooled after it is hot stretched. The temperature difference between baths B_2 and B_3 is a measure of the rate of quench.

Theory of Orientation

The theory of molecular orientation for amorphous polymers has been discussed in detail by many

Fig. 6—Typical birefringence at different degrees of orientation



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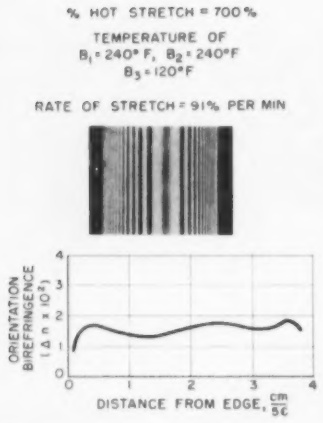

Fig. 7—Birefringence as a function of the distance from edge to strand

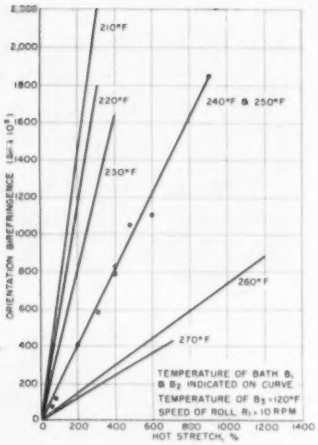

Fig. 8—Effect of percent hot stretch on orientation of polystyrene at various temperatures

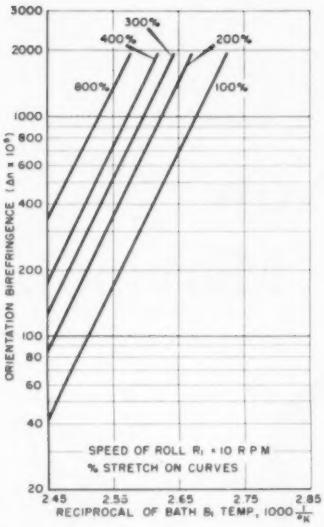

Fig. 9—Effect of temperature of stretching on orientation of polystyrene at various degrees of hot stretching

authors (1, 8, 21)[1]. It will be briefly reviewed here.

The configurations of the polymer chains in an unoriented state are random. When constant stress is applied to a linear polymer as in the case of hot stretching, three types of deformation take place. The total deformation γ_T, is expressed by the following equation:

$$\gamma_T = \gamma_1 + \gamma_2 + \gamma_3 \quad \text{(Eq. 1)}$$

γ_1 is the instantaneous elastic deformation. It is caused by bond stretching or valence angle deformation. It is independent of time and temperature. This deformation is recoverable as soon as the stress is removed.

γ_2 is a high elastic deformation caused by uncoiling and orienting the chain molecules. This is accomplished by rotation of molecular segments about appropriate carbon-to-carbon bonds. The molecules have a tendency to align themselves in a direction parallel to the axis of stretch. It is this orientation that is frozen in the filament when the stress is relieved after the fiber is quenched. The extent of this high elastic deformation is indicated by birefringence. The factors affecting orientation are dependent on fabricating conditions. These factors are evaluated in terms of birefringence.

γ_3 is a plastic viscous deformation caused by the molecules sliding past each other. This deformation is not recovered when the stress is removed.

The mechanical behavior of a high polymer when stretched can be represented by a model shown in Fig. 2. G_1 is the instantaneous elastic response modulus and is represented by means of a spring. G_2 and η_2 depict the retarded elastic response caused by the uncoiling and orienting the polymer chains. In the mechanical model it is represented by means of a spring whose elastic response is retarded by a Newtonian dashpot. The ratio

$$\frac{\eta_2}{G_2} = \tau \quad \text{(Eq. 2)}$$

is defined as the retardation or orientation time. η_2 is the actual flow of the polymer and is portrayed for simplicity as a Newtonian dashpot.

In the preceding paragraph a single orientation time was used to represent the configurational elasticity of the polymer. Actually, the behavior of a polymer can be best represented as a continuous distribution of retardation times (1, 2, 14). The model representing a simple polymer (Fig. 2), is replaced

[1] Numbers in parentheses refer to references at end of article.

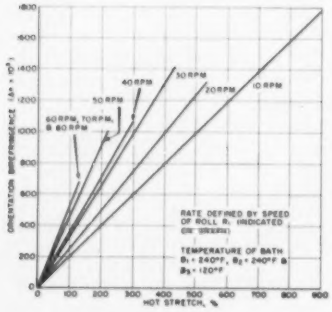

Fig. 10—Effect of rate and amount of stretch on orientation of polystyrene

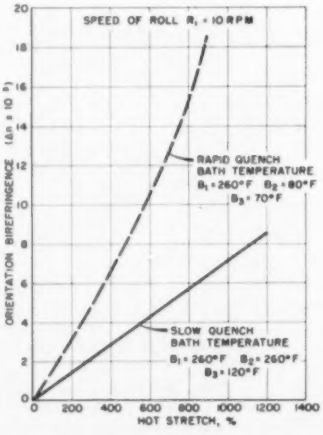

Fig. 11—Orientation as function of quenching bath temperature and percent hot stretch

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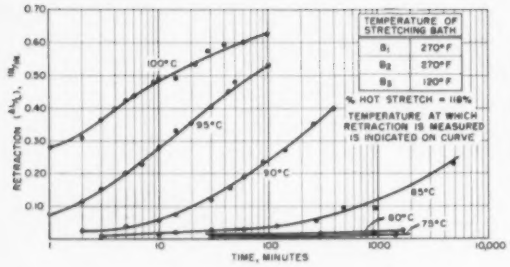


Fig. 12—Retraction of polystyrene monofilament hot stretched 118% versus time at various temperatures

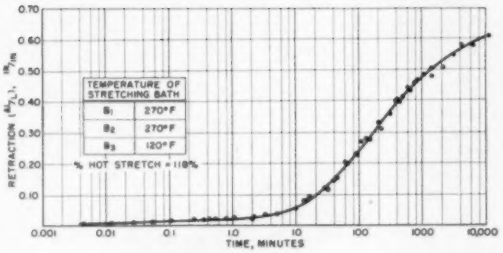


Fig. 13—Typical retraction curve at 90° C. for polystyrene monofilament hot stretched 118 percent

by the model as shown in Fig. 3. The distribution of retardation time as represented by Fig. 3 is referred to as the retardation or orientation time spectrum. This distribution of elastic properties is represented mathematically by a continuous function $J(\tau)$. This function, $J(\tau)$, represents the amount of elastic compliance that has a retardation time of τ. To represent the total deformation in terms of an orientation time spectrum, equation 1 is rewritten in the following manner to form the expression

$$\gamma_t = \frac{S}{G_1} + S\int_0^\infty J(\tau)\,[1-e^{-t/\tau}]\,d\tau + \frac{S}{\eta_3}t \qquad \text{(Eq. 3)}$$

where S = stress, t = time, η_3 = apparent flow viscosity, G_1 = instantaneous elasticity modulus, and τ = retardation time.

$$\frac{1}{G_2} = \int_0^\infty J(\tau)\,d\tau$$

where G_2 is the configurational elasticity modulus.

The portion of the retardation spectrum oriented is a function of fabricating condition. Retraction data enable one to determine the retardation spectrum oriented at any one fabricating condition. This will be discussed later.

Theory of Birefringence

The usual techniques of studying orientation of filaments by X-ray diffraction patterns cannot be used in evaluating oriented polystyrene monofilaments. As shown by numerous investigators (10, 13, 23), highly stretched polystyrene exhibits very little crystallinity. Figure 4 shows typical X-ray diffraction patterns of highly oriented and poorly oriented monofilaments. Note from the diffraction pattern of the highly stretched monofilament the slight splitting of the inner ring. This indicates that at best, highly stretched polystyrene monofilaments assume only medium orientation and do not partially crystallize as do saran, nylon, etc.

A satisfactory method of ascertaining the degree of orientation is by birefringence measurements. The method is sensitive enough so that slight changes in structure can be readily detected. The theoretical aspects of this technique have been discussed by a number of authors (8, 12, 20, 21). Muller (16) derived the following equation relating birefringence to structure from theoretical consideration:

$$\Delta n = -\frac{\pi(\bar{n}^2+2)}{3n}\,a\,\frac{16}{15}\,N\left(\frac{\alpha_{11}+\alpha_{22}}{2}-\alpha_{33}\right)\frac{\Delta L}{L} \qquad \text{(Eq. 4)}$$

where Δn = orientation birefringence, $\bar{n}$ = mean refractive index of polystyrene, 1.59, α_{11}, α_{22}, and α_{33} = polarizability of styrene monomer along three principal directions, $\Delta L/L$ = stretch ratio, N = number of chains per unit volume, π = a constant, 3.1416, and a = a constant characterizing the orientation of the polymer chains.

Birefringence is defined (9, 22) as the difference of index of refraction along the optical axis of the

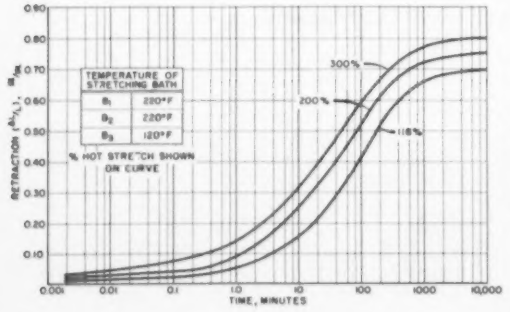


Fig. 14—Retraction curves at 90° C. for polystyrene monofilaments stretched at 220° F.

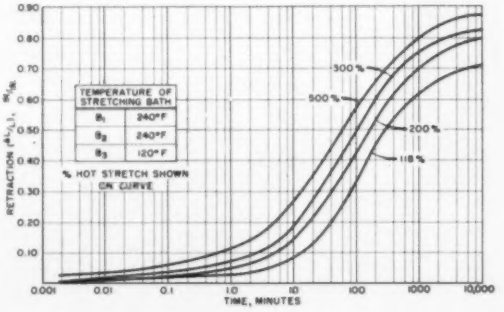
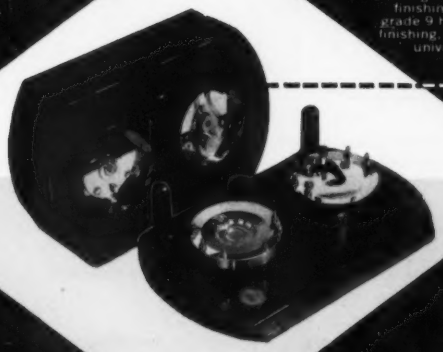
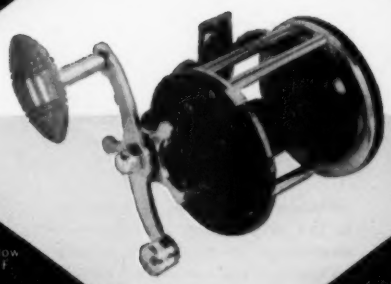


Fig. 15—Retraction curves at 90° C. for polystyrene monofilaments stretched at 240° F.



For initial polishing of these molds used to produce Bakelite fishing reel ends, Horrocks-Ibbotson uses Elgin DYMO grade 45 medium. Preliminary finishing is with Elgin DYMO grade 9 heavy—and for final fine finishing, Elgin DYMO grade 3 universal is used.



Note high finish on molded parts of reel . . . held to precision tolerances and molded from 90 flow black Bakelite at 3500 psi at 280° F.

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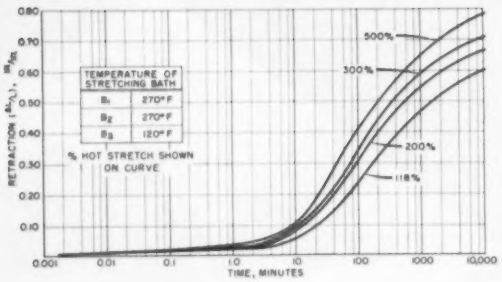

Fig. 16 (left)—Retraction curves at 90° C. for monofilaments stretched at 240° F.

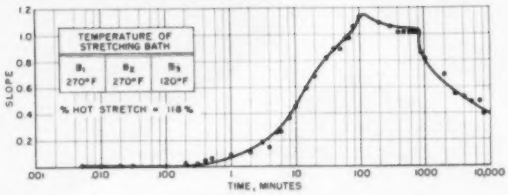

Fig. 17 (above)—Retardation time spectrum at 90° C. Monofilament hot stretched 118 percent

monofilament to that perpendicular to the optical axis. For a strained amorphous material, the principal optical axis will correspond with the axis of principal strain. In the case of polystyrene monofilaments the axis of principal strain coincides with the axis of stretch.

The birefringence of polystyrene is negative, i.e., the index perpendicular to axis of stretch is greater than the index parallel to the fiber axis. On stretching polystyrene, the benzene rings take position transverse to the direction of elongation. These rings, which have the highest polarizability in the plane of the ring, seem to determine the nature of the birefringence.

The molecular mechanism that causes birefringence in an amorphous substance like polystyrene is different from the asymmetric molecular arrangement that causes birefringence in a crystal lattice. To distinguish the two, the literature (8) refers to them as orientation birefringence and intrinsic birefringence, respectively. Throughout this report, the absolute value of orientation birefringence will be used as a measure of high elastic deformation.

Equation 4 justifies the use of birefringence as a measure of high elastic deformation or orientation. It shows that birefringence is a function of the amount of stretch $\Delta L/L$, the polarizability of the styrene molecule (α_{11}, α_{22}, and α_{33}), the position of the chains in reference to a preferred direction (a), and the number of chains per unit volume (N). Equation 4 can be written

$$\Delta n = -K \frac{\Delta L}{L} \qquad \text{(Eq. 5)}$$

In other words, orientation is a linear function of stretch ratio. This equation is valid only in the region where assumptions made in deriving equation 4 are justified.

Measurement of Birefringence

Birefringence of a filament is measured by means of a petrographic microscope. Figure 5 is a sketch of the apparatus used to determine the birefringence of a monofilament. Figure 6 shows typical birefringence photographs of a monofilament as obtained by the set-up described in Fig. 5. To compute the average orientation birefringence of a monofilament one uses the following formula[2], based on the assumption that the order of retardation is increasing across the diameter of the filament:

$$\Delta\bar{n} = \frac{\lambda LM}{2D}$$

where $\Delta\bar{n}$ = average birefringence, λ = wavelength of light used, L = number of dark bands, M = magnification, and D = magnified diameter of monofilament (obtained from photograph).

Much valuable qualitative information can be obtained from visual inspection of birefringence photographs. Figure 6 shows typical birefringence photographs of three samples fabricated at different conditions. Examining fibers by this method provides a convenient control technique for filaments while being fabricated.

Basic quantitative information can be obtained from birefringence study. One can determine the homogeneity of orientation. This is accomplished by computing the birefringence as a function of the distance from the center of the filament. Figure 7 is typical of such a computation. Since the curve is approximately horizontal, it indicates that the fiber is homogeneously oriented. Birefringence study provides a convenient method for evaluating the numerous fabricating variables of orientation. The basic disadvantage of birefringence data is that

[2] Derived from the formula (9, 11, 22):

$$\Delta n = \frac{\lambda}{\Delta t}$$

where n = birefringence, Δ = wave length, and Δt = optical path difference between two dark bands.

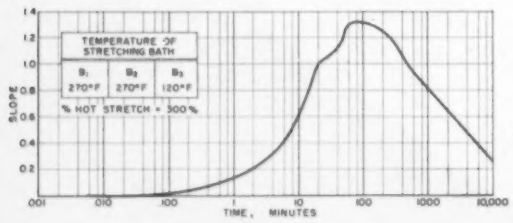

Fig. 18 (above)—Spectrum at 90° C. Filament 300% hot stretched

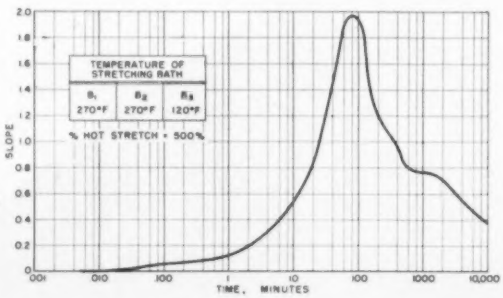

Fig. 19 (right)—Retardation time spectrum at 90° C., 500% hot stretch

Lynn Scott, Director of the Plaskon Home Arts Council, nationally-known home stylist.

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they fail to indicate what class of molecules of a certain retardation time is being oriented. The second disadvantage is that they do not tell whether the sample under examination is crystalline or amorphous. Whether the monofilament is crystalline or amorphous and what portion of the retardation spectrum is oriented are important considerations when correlating physical properties with birefringence data.

Factors Affecting Orientation

Numerous factors affect the orientation of polystyrene monofilaments. Specifically, they are percent hot stretch, temperature of stretching bath, rate of stretch, and rate of quenching the filament after being hot stretched. Birefringence provides a convenient method to evaluate the relative effects of these variables.

Hot Stretch—Figure 8 is a series of curves showing the effect of percent hot stretch on orientation birefringence for different stretching bath temperatures. The maximum amount of hot stretch which can be given a strand for any one bath temperature depends on the ultimate tensile strength of the material and the physical limitations of the mechanical setup. At low stretching bath temperature (220-230°F), the tensile strength determines the maximum percent hot stretch. At very high bath temperature (280-290°F), the polystyrene becomes rubbery; therefore the mechanical limitations on the speed of roll R_2 governs the maximum percent hot stretch. In all cases presented in Fig. 8, the curves are terminated at the point of maximum percent hot stretch given the fiber.

At any one stretching bath temperature, the curves of Fig. 8 are linear. This is in agreement with equation 5. Since the curves are linear, they do not approach asymptotically to any maximum value. In other words, even though the monofilaments have been stretched as much as 1000%, maximum value of orientation has not been attained.

It is further noted that the curves of birefringence versus percent hot stretch all pass through the origin. The physical significance of this is that orientation of polymer chains can be only achieved if the filament is stretched. This is in accordance with the theory presented earlier. The results presented in this section are in agreement with those presented by Muller regarding the stretching of polystyrene film (16).

Temperature of Stretching Bath—As shown in Fig. 8, the temperature of the stretching bath is an important and critical factor in fabricating monofilaments. To obtain a clearer picture of the effect of temperature, the data of Fig. 8 have been replotted. Figure 9 is a plot of the log of orientation versus the reciprocal of absolute temperature. The series of curves represent a family of curves for different percent of hot stretch. As shown by Fig. 9, orientation decreases as temperature of stretching bath increases. This is consistent with the theory which states that rate of disorientation caused by flow is greater at the elevated temperature.

There are certain advantages gained by orienting at elevated temperatures. From a practical viewpoint, greater output can be achieved at the elevated temperatures. The material is rubbery at the higher temperature, thus allowing a greater rate and percent of stretch to be used in fabricating filaments. From a theoretical viewpoint, a better filament could be produced since at the elevated temperature more of the longer retardation time portion of the spectrum is oriented.

Rate of Stretch and Quench—As shown in the previous section, the rate of disorientation increases at elevated temperature. To minimize disorientation, the monofilament can be stretched, or quenched, at a higher rate. Figure 10 shows a series of curves of birefringence orientation versus percent hot stretch for different stretching rates. The stretching rate is defined by the speed of roll R_1. For any constant percent stretch, orientation increases as the rate of stretch is increased. This increase approaches a limiting value where rate has very little effect on orientation. Orientation is higher at the greater rate of stretch primarily because less disorientation occurs. The sample is in the stretching bath a shorter length of time at the higher rate.

Greater rates of stretch mean greater output. The factor that governs the maximum rate of stretch is the ultimate tensile strength of

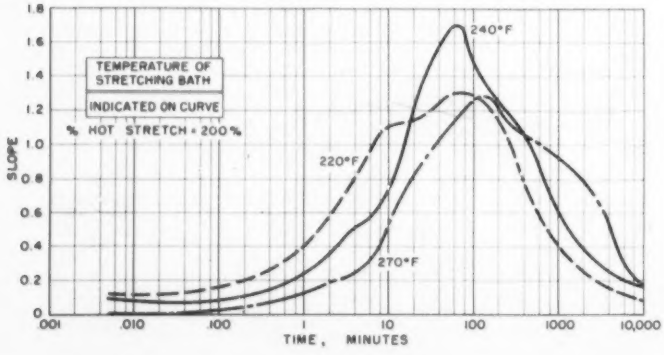

Fig. 20—Retardation spectra at 90° C. for different bath temperatures

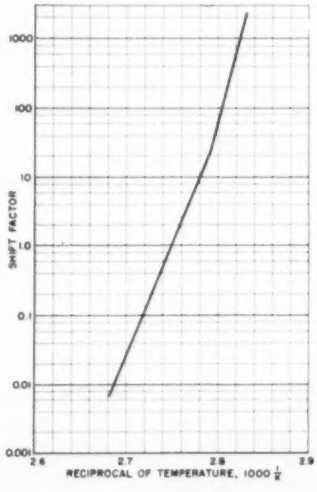

Fig. 21—Shift factor as function of reciprocal of temperature

Table I—Shift Factors For Plotting Retraction Curves At 90° C.

Shrinkage Bath Temp., °C —	80	85	90	95	100
Shift Factor —	1125	24.3	1	0.075	0.00905

polystyrene at the elevated temperature. The strand will break during fabrication beyond the point of maximum tensile strength.

The second method of minimizing disorientation is by increasing the quenching rate after the filament is hot stretched. This is accomplished by cooling the filament more rapidly to temperatures below the transition temperature. Figure 11 illustrates the increase of orientation at the higher quenching rates. This last method of minimizing disorientation will induce greater thermal strains in the monofilament, and preserve more of the shorter retardation time chains. These two factors tend to lower heat stability of the monofilament.

Retraction of Monofilaments

Birefringence study gives one type of information. It provides an index of the extent of orientation at any one fabricating condition. It fails to distinquish what portion of the retardation spectrum $[J(\tau)]$ is oriented at any fabricating condition. This is an important consideration when one wishes to correlate birefringence data with physical properties. Retraction data enable one to determine the portion of the retardation spectrum oriented at any one fabricating condition.

Method of Obtaining a Retraction Curve—Shrinkage of the oriented polystyrene monofilament is measured as a function of time in a well-regulated bath at various temperatures. The retraction curve is obtained from the shrinkage data illustrated in Fig. 12 in the following manner: The curves are shifted horizontally until they coincide to some retraction curve at an arbitrary temperature. In analyzing the data in this investigation, the curves were arbitrarily shifted to the 90° C. retraction curve. The amount and direction of shift for any one curve is tabulated. These two variables are important in order to compute the new time scale of the shifted curve. For example, a retraction curve at a bath temperature of T_2 is shifted to the left horizontally to a retraction curve at a bath temperature of T_1. The amount of shift is equal to a time constant "A". Mathematically, shifting to the left is equivalent to subtracting abscissa values. This is expressed by the following equation:

$$\log t_1 - \log t'_1 = \log A \qquad \text{(Eq. 6)}$$

$$\therefore\ t'_1 = \frac{t_1}{A}$$

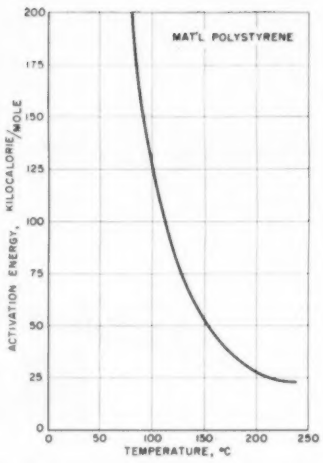

Fig. 22—Activation energy as a function of temperature

where t_1 = original time scale, t'_1 = new time scale, and log A = shift factor.

The equation formulated above is written in terms of logarithms since the data are plotted as retraction versus log time. With the aid of this equation the time scale of the shifted retraction curve can be recomputed in terms of the scale of the fixed curve. These data are then replotted in terms of the new time scale. Figure 13 is a typical shrinkage curve obtained by the above procedure. These data as obtained in the laboratory are presented in Fig. 12.

Shrinkage Curves

Figures 14, 15, and 16 show a series of shrinkage curves of monofilaments fabricated under different conditions which are noted on each curve. Note that the shrinkage of each curve exceeds the amount of

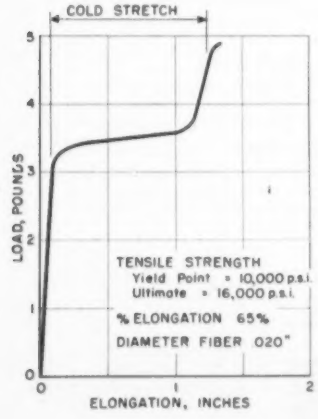

Fig. 23—Typical stress-strain curve for polystyrene monofilament

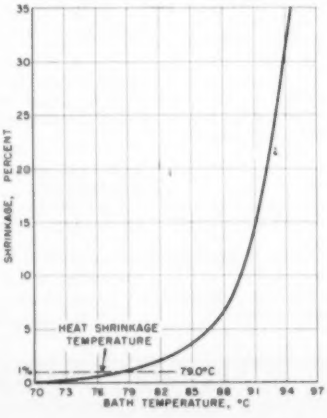

Fig. 24—Typical heat shrinkage curve with bath temperature changes

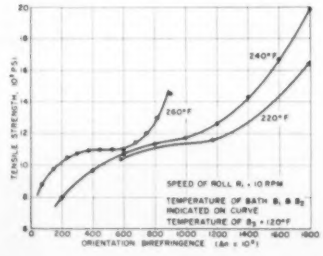

Fig. 25—Tensile strength versus orientation

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hot stretch given between rolls R_1 and R_2. The discrepancy is due to mechanical difficulty inherent in the monofilament orientation unit. There is some hot stretching of the fiber, probably of the order of 50%, between the extruder and roll R_1. If this value is added to the percent hot stretch given between rolls R_1 and R_2, the experimental results will be consistent.

The procedure of obtaining a retraction curve by shifting the curves of different bath temperature is analogous to the technique of obtaining a creep or relaxation function of a plastic specimen. The latter two techniques are described by many investigators (2, 3, 14, 18).

Table II—Activation Energy For Polystyrene

Temp.	*Activation Energy*	*Method*	*Source*
°C.	kcal./mole		
225-260	23	Melt viscosity. Capillary type of viscometer	Ref. 19
217	24	Melt viscosity. Coaxial type of viscometer	Ref. 7
200	30		
175	38		
150	52		
138	66		
125	100		
85-100	147	Retraction	This paper
80-85	200		

Table III—Optimum Physical Properties For Monofilaments Made Of Polystyrene Of Various Molecular Weights

Molecular wt.[a] of polystyrene	*Tensile strength*	*Elongation*	*Flexure (Bends to break)*	*Knot strength*	*Stiffness*	*Heat shrinkage (1%) temp.*
	p.s.i.	%		p.s.i.	10^5 p.s.i.	°C.
110,000	12,500	56	95	10,600	4.1	84
142,000	16,800	60	130	14,700	4.5	80
156,000	16,300	73	94	14,200	4.3	87
205,000	17,600	71	74	12,000	4.5	84
235,000	17,200	61	78	—	4.0	85

[a] Determined by light scattering method.

Retardation Spectrum

It was previously shown that a linear polymer can be characterized by a continuous distribution of orientation time (τ). This distribution is represented mathematically by a continuous function $J(\tau)$. Hot stretching of polystyrene enables one to orient a portion of the retardation spectrum, which can be computed from retraction data.

The distribution function $J(\log \tau)$ is related to the slope of the retraction curve as follows:

$$L'(\log t) = K\alpha(\log \tau) = S(\tau)J(\log \tau) \quad \text{(Eq. 7)}$$

where $L'(\log t)$ = slope of retraction curve, τ = retardation time as defined in equation 2, $S(\tau)$ = stress function, describes manner in which the filament is fabricated, $J(\log t)$ = compliance distribution function, and K = an arbitrary constant. $\alpha(\log \tau)$ is defined as the strain function. Mathematically, it represents the amount of strain that has a retardation time of τ. This function is assumed to be continuous.

The plot of $\alpha(\log \tau)$ versus $\log \tau$, or the equivalent plot of $L'(\log t)$ versus t represents the strain spectrum of the material. These curves depict the portion of the retardation spectrum oriented at any one fabricating condition. Figures 17, 18, and 19 represent typical strain spectrum obtained for oriented monofilament.

The total strain γ_T of the monofilament can be obtained by integrating

Table IV—Physical Properties of 0.025-in.-Diameter Polystyrene Monofilaments[a] Subjected to Minimum Annealing Treatment

Annealing Time	*Annealing Temp.*	*Tensile strength*	*Knot strength*	*Elongation*	*Flexure (bends to break)*	*Stiffness*	*Heat shrinkage*	*Orientation ($n = 10^{-5}$)*
min.	°C.	10^3 p.s.i.	10^3 p.s.i.	%		10^5 p.s.i.	°C.	
None	—	16.4	13.2	63.0	170	4.0	79.5	1600
60	55	16.9	13.0	70.3	220	3.5	82.5	1600
60	60	16.7	—	60.8	220	4.2	83.5	1820
60	65	17.5	12.8	69.3	170	3.5	82.5	1720
15	70	16.2	13.6	63.7	170	3.5	85.0	1720
15	75	16.2	15.0	63.1	170	4.0	85.5	1800
5	77	15.4	13.3	70.0	160	3.1	85.5	—
2	80	15.6	14.6	60.5	200	3.1	85.5	1720
2	85	16.5	13.2	63.0	180	3.4	87.0	1630
2	87	15.9		59.0	175	3.9	87.0	1720

[a] Fabricating conditions; Stretching bath temp. B_1 .... 240° F.; B_2 .... 240° F.; B_3 .... 120° F.; — Percent hot stretch . . 800% — Speed of roll R_2 . . 10 r.p.m.

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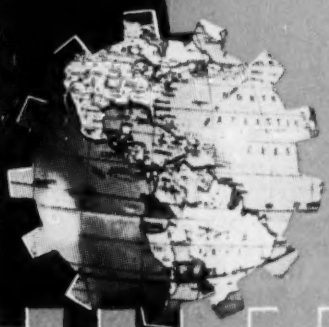

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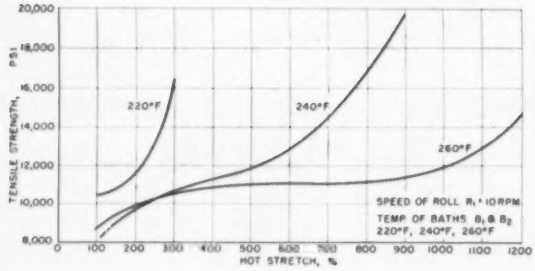

Fig. 26 (left)—Tensile strength as function of hot stretch

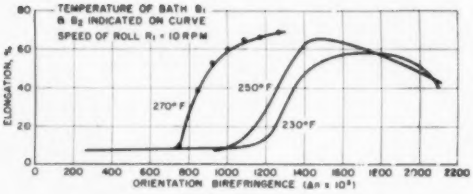

Fig. 27 (above)—Elongation versus orientation birefringence

equation 7 with respect to log τ in the following manner:

$$\gamma_T = \int_{-\infty}^{\infty} L' (\log t) d \log t$$

$$= K \int_{-\infty}^{\infty} a(\log \tau) d \log \tau$$

$$= \int_{-\infty}^{\infty} S(\tau) J (\log \tau) d \log \tau$$

The strain spectra for monofilaments fabricated at constant stretching bath temperature but for different percent stretch all coincide, as can be ascertained by comparing Figs. 17, 18, and 19. This indicates that the portion of the retardation spectrum oriented is independent of percent hot stretch. Increasing percent hot stretch increases the number of molecules of certain retardation time that are oriented. This is ascertained by birefringence measurements. It has been shown that birefringence increases as a linear function of the percent hot stretch. Birefringence number is an index which represents the extent of orientation at any one fabricating condition.

Fabricating monofilaments at a higher stretching bath temperature causes the retardation spectrum to shift to the right. This can be ascertained by comparing the retardation spectrum of monofilaments fabricated at different bath temperature and at a constant percent hot stretch. The result, as illustrated in Fig. 20, is explained on the basis that at the higher stretching bath temperature, the longer portion of the retardation spectrum is oriented. Simultaneously, at the higher bath temperature, one disorients the short retardation time chains.

The results of this study explain why physical properties of oriented polystyrene are not a function of birefringence number only. In other words, knowing the orientation as represented by birefringence one cannot predict the physical properties. Physical properties are a complex function of the extent of orientation and the portion of the retardation spectrum that is oriented. These two variables, as shown by the birefringence and retraction data, are critically dependent on fabricating variables.

Shift Factor

In the discussion of the method of obtaining the retraction curve for polystyrene monofilaments, the concept of the shift factor was introduced. Table I lists the shift factor obtained for different temperatures. It is independent of the monofilament fabricating conditions and is a function of bath temperature only.

The shift factor enables one to compute the activation energy. To accomplish this, plot the shift factor versus the reciprocal of the absolute temperature. The slope of the curve is equal to the activation energy. Figure 21 is a plot of the data obtained in this investigation. Note from the curve that in the region of the transition temperature (80-85° C.) the slope of the curve increases. This is consistent with the theoretical picture of the mechanism of flow.

Table II lists the activation energy for polystyrene as obtained from viscosity and retraction study for a wide range of temperatures. The table lists the source and method of obtaining the data. Figure 22 is a graphic representation of the data in Table II. Retraction experiments provide a convenient method for computing the activation energy in the region of transition temperature. To compute the activation energy in this region by viscosity measurements is difficult. High rate of shear must be attained in order to measure appreciable flow.

Numerous authors (1, 2, 4, 5, 15, 16, 17) have discussed how physical

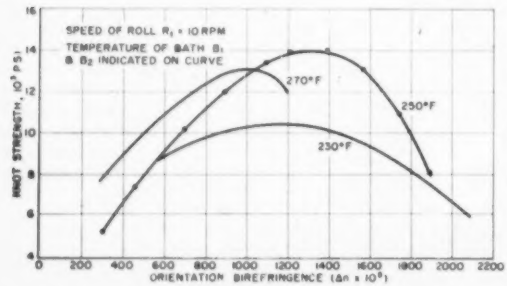

Fig. 28—Knot strength versus orientation birefringence

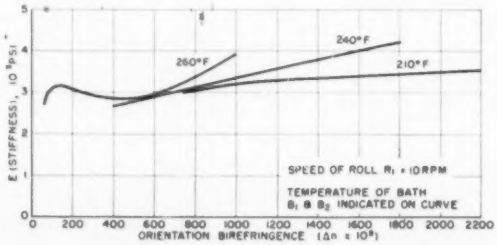

Fig. 29—Graph showing series of curves of stiffness modulus plotted against orientation birefringence for different bath temperatures

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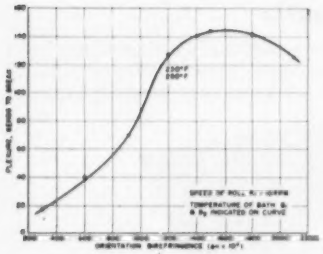

Fig. 30—Flexure versus orientation

properties of polystyrene or any other types of linear high polymer are affected by orientation. The results presented in this paper are unique in that the effects of fabricating variables as well as orientation on physical properties are discussed.

Physical Properties of Monofilament

The number of physical properties that can be evaluated for monofilaments are innumerable. It was concluded that the most important properties to consider depend largely on the end use of the monofilament. In the case of polystyrene monofilament, one important end use is synthetic bristles. Because of this it was decided that it would be best to evaluate the following physical properties: tensile strength, knot strength, elongation, flexure, stiffness, and heat shrinkage.

Tensile Strength—A constant rate of load testing machine was used. Distance between jaws was 2 inches. The rate of loading was 0.5 lb./sec. with a 10 lb. load on the machine and 1.25 lb./sec with a 25 lb. load. Figure 23 shows a typical stress-strain curve of oriented polystyrene monofilament.

Elongation—This is the amount of cold stretch at room temperature, given a sample of monofilament before fracture (Fig. 23).

Knot Strength—One of the most important characteristics of a good monofilament is high knot strength. All monofilaments in use are subject to sharp bends, knots, and kinks. The knot strength of polystyrene monofilament was determined by tying a loose knot in a section of filament and then determining the tensile strength.

Stiffness—Stiffness is a measure of the ability of a monofilament to withstand bending. The modulus of

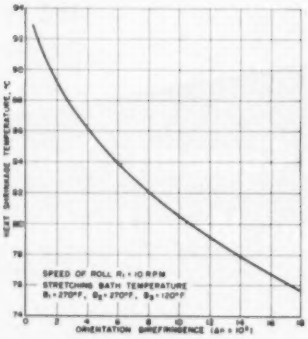

Fig. 31—Heat shrinkage temperature as a function of orientation and stretching bath temperature

stiffness of monofilament was measured by A.S.T.M. D 747-48T (24).

Flexure—The ability of a monofilament to withstand repeated bending before breaking was measured by placing the strand under slight tension and then bending it at a constant angle and rate. Results are reported in terms of number of bends to break a sample of monofilament.

Heat Shrinkage Temperature—Heat stability is an important property of monofilament. Numerous tests have been proposed to evaluate this property. In this investigation an empirical test was used. The test is as follows: Monofilaments are placed in a constant temperature bath for 2 minutes, removed, quickly quenched to room temperature and percent shrinkage is noted. The temperature of the bath is raised 3° C. and the procedure repeated. The percent shrinkage is plotted versus the bath temperature. Figure 24 is a typical heat shrinkage curve. Arbitrarily, the heat shrinkage temperature is defined as the temperature at which the fiber shrinks 1 percent.

Effects of Orientation and Stretching Temperature

Tensile Strength—Poorly oriented polystyrene is normally brittle and has a tensile strength of 5000 to 7000 p.s.i. When properly oriented its tensile strength increases as much as four fold.

Figure 25 shows a series of curves of tensile strength versus birefringence for different stretching bath temperature. In all cases tensile strength increases as orientation increases. At the higher stretching bath temperatures, high tensile strength is obtained with less orientation. This is typical of all physical properties versus orientation curves. Subsequent curves will illustrate this point.

These curves show that physical properties are not a function of birefringence number only. In other words, knowing the orientation as represented by birefringence, one cannot predict the physical properties. Physical properties are a complex function of the extent of orientation, as represented by birefringence number, and the portion of the retardation spectrum oriented. These

(*Continued on p. 196*)

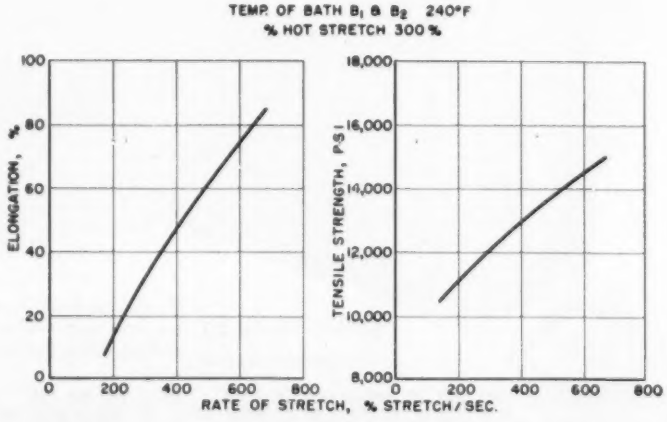

Fig. 32—Effect of stretch rate on tensile strength and elongation

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Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

General

CURRENT SALES TRENDS IN PLASTICS MATERIALS. Brit. Plastics *26*, 1-5 (Jan. 1953). The sales trends of the various types of plastics in the United Kingdom are traced for the last three years. British production figures for the years 1943-1951 are also presented.

PLASTICS "KNOW-HOW." J. H. Day. SPE J. *9*, 16-19, 21 (Jan. 1953). The current magazines, both domestic and foreign, concerned with plastics are listed and described briefly.

A DREAMER'S FUTURE FOR PLASTICS. J. Formo. SPE J. *9*, 10-12, 23 (Jan. 1953). Various immediate practical problems in the plastics industry which need solutions are described. These include materials, processing, and testing.

PLASTICS. E. E. McSweeney. Chem. Eng. News *31*, 37-8 (Jan. 5, 1953). The accomplishments of the plastics industry in 1952 are reviewed briefly.

Materials

LIQUID POLYMERS OF ACRYLIC ESTERS. C. E. Rehberg and J. Siciliano. Ind. Eng. Chem. *44*, 2864-6 (Dec. 1952). Neutral, thermally and chemically stable, halogen-free, liquid polyacrylic esters were desired for evaluation of plasticizers and hydraulic fluids. These polymers were prepared by polymerization of alkyl acrylates in isopropylbenzenes as solvents, with and without use of dodecyl mercaptan. Best results were obtained by conducting the polymerization in refluxing triisopropylbenzene. As much as half the product was distillable, and the distilled portions were further fractionated to obtain relatively homogeneous fractions. Most of the products were compatible with polyvinyl chloride-acetate, especially the higher boiling distilled fractions. All were clear, thermally stable liquids with little color or odor (except those made with mercaptan). These properties, together with low ASTM viscosity-temperature slopes and a wide range of viscosities, suggest use of the materials as plasticizers, hydraulic fluids, and synthetic lubricants.

SOME ELECTRICAL AND OTHER PROPERTIES OF GLASS REINFORCED PLASTICS. Brit. Plastics *25*, 382-5 (Nov. 1952). Data are presented and discussed which show that a wide range in properties can be obtained with glass fabric laminates by varying the type of resin. Information on laminates made with phenolic, melamine, silicone, polyester, and thermoplastic resins is given.

PREPARATION AND PROPERTIES OF SOME ETHER AND ESTER DERIVATIVES OF HYDROXYETHYLCELLULOSE. S. G. Cohen, H. C. Haas, L. Farney, and C. Valle, Jr. Ind. Eng. Chem. *45*, 200-03 (Jan. 1953). The synthesis and properties of several ethers and esters of hydroxyethylcellulose are reported.

PRODUCTION, PROPERTIES, AND APPLICATIONS OF THE NEW BRITISH POLYETHYLENE TEREPHTHALATE FILM. R. A. Hudson. Brit. Plastics *26*, 6-9 (Jan. 1953). The properties of polyethylene terephthalate film are described. The general, physical, and electrical properties are outstanding. The tensile strength is 25,000 p.s.i. at 50% elongation. The dielectric constant at a kilocycle per sec. is 3.0 and the power loss factor is 0.014. It is recommended for use in the photographic, electrical, and packaging fields. The method of manufacture is described briefly.

COPOLYMERS OF PERFLUORO-OLEFINS. R. M. Adams and F. A. Bovey. J. Polymer Sci. *9*, 481-92 (Dec. 1952). Attempts to polymerize perfluoropropene, perfluorobutene-1, perfluorobutene-2, perfluoroisobutene, perfluoropentene-1, and perfluorononene-1 were unsuccessful. However, certain nonfluorinated, nonconjugated comonomers—ethylene, vinyl chloride, vinyl acetate, and the vinyl alkyl ethers—were found to copolymerize readily, giving copolymers containing up to 50 mole percent, and in some cases slightly more than this, of the perfluoro-olefin in the copolymer. The higher members of the series copolymerize in general less readily than the lower members. The products ranged from viscous oils to tough, film-forming solids. The difficulty of homopolymerization and the relative ease of copolymerization of the perfluoro-olefins with the above comonomers are discussed and interpreted in terms of probable electron distributions around the double-bond.

CHELATE ION EXCHANGE RESINS. H. P. Gregor, M. Taifer, L. Citarel, and E. I. Becker. Ind. Eng. Chem. *44*, 2834-9 (Dec. 1952). An ion exchange resin which is specific toward certain metallic ions, as differentiated from the conventional ion exchange resins which are merely selective toward various groups of ions, is described. Monomers which contain chelate groups and are capable of condensation reactions were prepared and the corresponding resins made. The *m*-phenyl diglycine-formaldehyde resin shows fairly specific reactions at different pH levels. Absorption increases with increasing pH, usually to a well-defined maximum, and then declines; this sorption takes place at different pH levels with different metals. The absorptive capacity of the resin increases with increasing metal ion concentration and is somewhat independent of ionic strength at higher concentrations.

Molding and Fabricating

EXTRUSION TRENDS. M. S. Greenhalgh. SPE J. *9*, 7-9 (Jan. 1953). The effects of variables in the extrusion of plastics on the properties of the product are described.

Applications

REVIEW AND PREVIEW. Modern Packaging *26*, 83-9, 188, 190 (Jan. 1953). The developments and progress of the packaging industry in 1952 are reviewed. One major item was the tremendous increase in the use of plastic materials, particularly polyethylene bottles.

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ULATING MACHINE. Brit. Plastics 25, 400-01 (Dec. 1952). The use of laminates in the construction of a punched card accounting machine is described.

LARGEST MOLDING IMPROVES RADAR EQUIPMENT. Brit. Plastics 25, 346-50 (Oct. 1952). A large molding made of phenolic-impregnated asbestos and having a honeycomb core is described.

Properties

TENSILE IMPACT PROPERTIES OF SOME PLASTICS. B. Maxwell, J. P. Harrington, and R. E. Monica, SPE J. 8, 22-5 (Dec. 1952). The results of tensile impact tests with polymethyl methacrylate, ethyl cellulose, phenolic, polyvinyl chloride, and nylon plastics are reported. Conclusions of theoretical significance are: 1) The yield strength increases logarithmically with the rate of loading. 2) an increase in temperature causes a change in the yield strength, which is similar to that caused by a decrease in the rate of straining. 3) It is usually possible to find two distinct energy drops for thermoplastics in the velocity range covered in this study. 4) Energy drops would not be found in materials that do not exhibit plastic flow. 5) Plastic flow (chain-chain slipping) can not take place at velocities greater than the lower critical velocity, which is determined by the first energy drop. 6) Retarded elastic deformation (chain uncoiling) can not take place at velocities greater than the second critical velocity, which is determined by the second energy drop. 7) Only elastic deformation takes place above the second critical velocity. Practical conclusions are: 1) Impact tests should be performed over a wide range of rates of straining to properly evaluate the properties of a material. 2) These impact tests should also be performed over the temperature range to be expected in any applications of the material. 3) The addition of plasticizer to the polymeric material shifts the location of the energy drops out on the rate of straining scale and also increases the energy the material can absorb at velocities below this drop. In general, a material must "give" with the blow if it is to have a high impact strength. This may be accomplished by 1) having a high elastic response which would

give a large energy value above the second critical velocity, 2) having either a high energy for the retarded elastic response or a very rapid retarded elastic response (which would mean a high second critical velocity), or 3) having a rapid plastic response.

SHOCK RESISTANCE OF MOLDED THERMOSETTING PLASTICS. S. E. Yustein, R. R. Winans, J. M. Kerr, and L. E. Sieffert. Elec. Manuf. *51*, 110-13, 368 (Feb. 1953). An electronic machine for determining the shock resistance of plastics is described. The resistance of a material to shock may be dependent upon factors other than those which control its resistance to impact blows imparted by a striker, whether it be a pendulum or a falling ball. These factors are considered to be incorporated to a great extent in this machine. Hence the shock tests provided by the machine are considered to be of a simulative type and to afford the best basis available for estimating the comparative shock resistance of plastic materials. On the basis of the accumulated data and from a comparison of all the procedures studied and developed, it appears that the flexural shock tests employing the electronic shock machine offer the simplest and most convenient method for laboratory evaluation of the shock resistance of molded thermosetting materials. This test simulates shock conditions under actual service to such an extent that data obtained may be used as criteria for selecting plastic materials for use in the design of components of shockproof equipment.

PLASTICS: THEIR MECHANICAL BEHAVIOR AND TESTING. W. N. Findley. Applied Mechanics Reviews *6*, 49-53 (Feb. 1953). The mechanical behavior of a number of plastics is reviewed and the text is supplemented by 119 references.

TENSILE STRENGTH IN WAXES. R. T. Edwards. Modern Packaging *26*, 123-7, 169 (Feb. 1953). The tensile strengths of several paraffin waxes blended with microcrystalline wax are reported.

EFFECT OF MOLECULAR WEIGHT ON THE PHYSICAL PROPERTIES OF POLYSTYRENE. H. R. Jacobi. Kunststoffe *43*, 9-14 (Jan. 1953). Equations are developed which show the relationship between the molecular weight

and the physical properties of thin films of polystyrene.

GLOSS EVALUATION OF MATERIALS. R. S. Hunter. ASTM Bulletin No. 186, 48-55 (Dec. 1952). To materials engineers and technologists, gloss is a property of surfaces which causes them to have a shiny or mirrorlike appearance. This appearance cannot be measured; only specific reflectance capacities of surfaces can be measured. Although gloss may be associated with the capacity of a surface to reflect like a mirror, there is no single reflectance scale yielding values that correlate with the glossy appearance of all surfaces. This is because the capacities of surfaces to reflect light in and adjacent to the directions of mirror reflection are too complex and varied to be compared on any single scale. As a consequence, different gloss scales involving different geometric aspects of light reflectance have been developed. Each provides numbers correlating with the glossy appearance of the specific types of surfaces to which it is applicable. For certain types of glossy appearance, however, correlating methods of reflectance measurement do not exist.

Testing

APPARATUS FOR TENSION TESTING AT SUBATMOSPHERIC TEMPERATURES. E. T. Wessel and R. D. Olleman. ASTM Bulletin No. 187, 56-60 (Jan. 1953). Apparatus and procedure for low-temperature tension testing, which eliminate many of the undesirable features of previous methods, are described. Tests can be conducted at any temperature in the range from just below room temperature to −195.6° C. with the possibility of lowering this bottom limit to the temperature of liquid helium, −268.6° C. Predetermined test temperatures are reached and stabilized quite readily, conveniently, and accurately with an automatic control and recording system. The effect of testing media is minimized because the dry nitrogen vapor employed as a surrounding and cooling medium is essentially the same as air and low-temperature test results are comparable to data from tests made in air at elevated and room temperatures. Finally, the equipment is simple and relatively inexpensive, and the cost per test of the liquid nitrogen is very modest.

U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

POLYVINYL RESINS. M. K. Smith (to Baker Castor Oil). U.S. 2,624,716, Jan. 6. Stabilized plasticized polyvinyl compositions.

VINYL RESINS. I. I. Bezman and D. D. Browning (to Armstrong Cork). U.S. 2,624,718, Jan. 6. Vinyl resin dispersions.

MOLDING COMPOSITIONS A. F. Roche and R. M. Price (to Dow). U.S. 2,624,719, Jan. 6. Heat stabilized vinyl aromatic polymers.

RESINS D. B. Hatcher and R. H. Bunnell (to Libbey-Owens-Ford). U.S. 2,624,720-1, Jan. 6. Silicon-containing alkyd resins.

COPOLYMER. E. L. Kropa and A. S. Nyquist (to American Cyanamid). U.S. 2,624,722, Jan. 6. Silicon-containing alkyd resins.

COPOLYMER. E. L. Kropa and A. S. Nyquist (to American Cyanamid). U.S. 2,624,723, Jan. 6. Modified acrylonitrile copolymer.

POLYMERIZATION. H. F. Park (to Monsanto). U.S. 2,624,724, Jan. 6 Polymerization of vinyl chloride in water.

RESINS. G. E. Serniuk (to Standard Oil). U.S. 2,624,726, Jan. 6. Copolymerizates of diolefins and aromatics.

STRIP. E. E. Montross and P. L. Shurr (to Polymer). U.S. 2,624,913, Jan. 13. Mechanism for forming strips of polyamides.

SHEET. T. J. Rhodes (to U.S. Rubber). U.S. 2,624,914, Jan. 13. Apparatus for extruding plastic sheet.

MOLDING. K. J. Persak (to Du Pont). U.S. 2,624,916, Jan. 13. Process for molding polyethylene with glossy surface.

SEALING. E. W. Smith. U.S. 2,625,201, Jan. 13. Heat sealing apparatus for plastic sheet.

SHEET COMBINING. J. Cadgene. U.S. 2,625,497, Jan. 13. Process for fusing thermoplastic fabric sheets to each other.

PLASTIC RODS. K. A. Koch, (to Owens-Corning Fiberglas). U.S. 2,625,498, Jan. 13. Method of producing rods and bars of polyester resin and glass fibers.

SURFACED FABRIC. R. J. Nebesar (to Universal Molded Products). U.S. 2,625,499, Jan. 13. Treating glass fibers for reinforcing polyethylene and polymonochlorotrifluoroethylene.

SILICONES. J. B. Rust and C. A. MacKenzie (to Montclair Research and Ellis-Foster). U.S. 2,625,520, Jan. 13. Oxygen treatment of silicon oxyacid esters.

VINYL RESINS. W. F. Fisher and D. W. Young (to Standard Oil). U.S. 2,625,521, Jan. 13. Stabilized vinyl chloride resins.

COATING. J. D. Garber and W. J. Sparks (to Standard Oil). U.S. 2, 625,523, Jan. 13. Coating containing butadiene -iso-octene copolymer.

UREA RESIN. H. M. Kvalnes (to Du Pont). U.S. 2,625,524, Jan. 13. Viscous urea-formaldehyde resins.

POLYMERS. C. S. Lynch (to Phillips Petroleum). U.S. 2,625,525, Jan. 13. Terpolymers of sulfur dioxide, olefins, and a liquid conjugated diene polymer.

POLYMERS. W. J. Sparks and D. W. Young (to Standard Oil). U.S. 2,625,526, Jan. 13. Polyvinyl chloride-dienenitrile-polyester composition.

PLASTIC COMPOSITION. P. V. Smith, Jr. and D. W. Young (to Standard Oil). U.S. 2,625,527, Jan. 13. Copolymer of vinyl chloride, vinyl acetate, and a phthalic acid ester plasticizer.

RESINS. G. L. Doelling and K. H. Adams (to Mississippi Valley Research Laboratories). U.S. 2,625,530, Jan. 13. Phenolic resin-ether resin composition.

ISOCYANATE MODIFIED POLYMERS. N. V. Seeger (to Wingfoot). U.S. 2,625,531, Jan. 13. Elastomeric isocyanate-modified polyester resins.

VINYL RESINS. F. J. Williams and J. G. Hendricks (to National Lead). U.S. 2,625,533, Jan. 13. Color-stabilized vinyl resins.

RESINS. R. B. Thompson (to Universal Oil Products). U.S. 2,625,534, Jan. 13. Resinous reaction products of hydroxyaromatic aldehydes and mercaptans.

RESINS. T. G. Mastin and N. V. Seeger (to Wingfoot). U.S. 2,625,535, Jan. 13. Elastomeric diisocyanate modified polyesters.

POLYMERS. J. E. Kirby (to Du Pont). U.S. 2,625,536, Jan. 13. Reacting diamines with anhydridized dicarboxylic acids.

POLYMERIZATION. I. M. Kolthoff and W. J. Dale (to Phillips Petroleum). U.S. 2,625,537, Jan. 13. Polymerization with diazothioethers.

POLYMERIZATION. V. L. Folt (to B. F. Goodrich). U.S. 2,625,539, Jan. 13. Polymerization of vinyl chloride in water medium.

WORKING ROLLS. E. G. Schairer (to Armstrong Cork). U.S. 2,625,-709, Jan. 20. Apparatus for intensely working plastic materials.

SHEET MATERIAL. L. Eaby (to Armstrong Cork). U.S. 2,625,712, Jan. 20. Method for making mottled plastic sheet material.

TEMPLET. H. E. Renaud (to Renaud Plastics). U.S. 2,625,748, Jan. 20. Three dimensional plastic templet.

RESIN. F. A. Sattler, J. Swiss, and J. G. Ford (to Westinghouse). U.S. 2,626,223, Jan. 20. Reaction product of combined polyesteramide and a complex resinous epoxide.

RESINS. H. P. Brown (to B. F. Goodrich). U.S. 2,626,248, Jan. 20. Method of replasticizing polymeric metallo-carboxylates.

RESIN. H. Hönel and H. Manzano. U.S. 2,626,249, Jan. 20. Resol-alkyd resin products.

COATING. J. C. Petropoulos and L. E. Cadwell (to American Cyanamid). U.S. 2,626,250, Jan. 20. Vinyl monomer and oil-modified alkyd composition.

RESINS. R. W. James and W. B.

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It takes no crystal gazing to predict that broadening your product range will boost profits—especially when it means entering the *flexible* products market. That *could be* your future, and it can happen right now—*with your present equipment, without any added investment!* All you need is a change to VINYLITE Plastic *flexible* compounds. They fabricate easily on all standard machines.

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RESISTANCE . . . to oils, most chemicals, corrosive atmospheres, greases, water, alkalies.

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ABRASION-RESISTANT parts for vacuum cleaners, injection molded of VINYLITE Plastic flexible compounds. Quickly produced, these parts give long, lasting service, won't mar furniture.

Pings (to Imperial Paper and Color). U.S. 2,626,251, Jan. 20. Water-soluble cationic resins.

INTERPOLYMERS. P. O. Tawney (to U.S. Rubber). U.S. 2,626,252, Jan. 20. Interpolymers of trihalo alkenes.

POLYMERIZATION. W. T. Miller and J. T. Maynard (to U.S.). U.S. 2,626,254, Jan. 20. Method of polymerizing trifluorochloroethylene.

FILM. M. Lammertse (to Wingfoot). U.S. 2,626,422, Jan. 27. Method for stretching thermoplastic film.

TUBING. O. C. Stahl (to American Extruded Products). U.S. 2,626,-426, Jan. 27. Apparatus for extruding and coating plastic tubing.

EXTRUSION. G. S. Brown (to Western Electric). U.S. 2,626,247, Jan. 27. Apparatus for controlling plasticity of material during extrusion.

CONTAINER. M. M. Barton (to Injection Molding). U.S. 2,626,647, Jan. 27. Flexible thermoplastic container.

COMPOSITE SHEET. C. H. Allen (to Atomized Materials). U.S. 2,626,-873, Jan. 27. Textile impregnated with vinyl chloride-acetate-maleic acid copolymer.

VINYL RESIN. J. J. Carnes (to American Cyanamid). U.S. 2,626,-876-7, Jan. 27. Antistatic treatment for vinyl resins.

LAMINATE. W. M. Scholl. U.S. 2,626,886, Jan. 27. Sheet of cellular foam latex and a film of thermoplastic adhered thereto.

BLOWING AGENT. F. Lober, M. Bögemann, and R. Wegler (to Farbenfabriken Bayer). U.S. 2,626,933, Jan. 27. Organic sulfonic acid hydrazide blowing agent for plastics.

ADHESIVE. C. C. Kesler (to Penick and Ford). U.S. 2,626,934, Jan. 27. Resin-modified starch adhesive.

RESIN. M. DeGroote (to Petrolite). U.S. 2,626,935, Jan. 27. Acidic fractional ester of a polycarboxylic acid with oxypropylated glucose.

LINOLEUM COMPOSITIONS. F. J. Hahn (to Monsanto). U.S. 2,626,936, Jan. 27. Moldable resin composition.

ALLYL STARCH. M. DeGroote (to Petrolite). U.S. 2,626,937-8, Jan. 27. Oxypropylated allyl starch.

VARNISHES. H. M. Hoogsteen and

N. R. Peterson (to Dow). U.S. 2,626,939, Jan. 27. Alkyds and varnishes containing them.

TRIPOLYMER. W. J. Sparks and R. M. Thomas (to Standard Oil). U.S. 2,626,940, Jan. 27. Olefin-cyclodiene-divinylbenzene tripolymer.

RESIN. M. DeGroote (to Petrolite). U.S. 2,626,942, Jan. 27. Mixtures of oxyalkylated alkyl phenol-aldehyde resins.

STABILIZER. I. Skeist and S. B. McFarlane (to Celanese). U.S. 2,626,943, Jan. 27. Stabilizing polymerized methyl vinyl ketone.

POLYMERS. H. W. Coover, Jr. and J. B. Dickey (to Eastman Kodak). U.S. 2,626,944, Jan. 27. Polymers of alpha acylamido acrylic acids.

INTERPOLYMERS. F. J. Carlin (to U.S. Rubber). U.S. 2,626,945, Jan. 27. Interpolymerization of polyolefinic esters of 2-alkenyl alcohols with certain olefins.

POLYMERS. J. A. Price, W. M. Thomas, and J. J. Padbury (to American Cyanamid). U.S. 2,626,946, Jan. 27. Copolymer of a mixture of acrylonitrile, monoallyl amine, and an alkyl acrylate.

TIN POLYMER. G. P. Mack and E. Parker (to Advance Solvents). U.S. 2,626,953, Jan. 27. Polymeric organic tin compounds.

EXPANDED PLASTICS. I. L. Newell (to United Aircraft). U.S. 2,626,968, Jan. 27. Organic nitrite blowing agents for expanded plastics.

STRIPS. R. C. Rahm (to Polymer). U.S. 2,627,085, Feb. 3. Apparatus for the formation of plastic strips.

MOLDING. T. L. Hallenbeck (to Baker Brothers). U.S. 2,627,086, Feb. 3. Molding machine.

FILMS. F. P. Alles and W. R. Sauer (to Du Pont). U.S. 2,627,088, Feb. 3. Preparation of oriented coated films.

BAGS. N. H. Nye. U.S. 2,627,213, Feb. 3. Apparatus for making thermoplastic bags.

PRESS. D. W. Smith and H. Hall (to Tennessee Valley Authority). U.S. 2,627,291, Feb. 3. Press for laminated lumber consisting of two endless chains of platens.

NEW MACHINERY AND EQUIPMENT

HEATER-DRYER HOPPER ATTACHMENT—Pre-heating, drying, and conditioning material *after* it is put into the hopper is performed by a new hopper attachment manufactured by Ball & Jewell, Inc., 22 Franklin St., Brooklyn 22, N. Y. The heater-dryer can be installed on any injection or extrusion machine.

In operation, air is drawn through the fibrous glass filter (top left in the accompanying illustration), where dust or dirt are removed. The air then passes through the blower, through a thermostatically controlled heater, through the flexible hose into the hopper attachment, and to a heat spreader at the bottom of the machine hopper. The heat is distributed at its greatest intensity directly above the plasticizing cylinder. This air, heated to temperatures up to 235° F., removes moisture and preheats the material. Moisture is dispersed through an opening between the machine hopper and hopper attachment. A glass viewer on the attachment enables the operator to see when to add more material.

Model A12 has a heater capacity of 2400 watts and a 1/3-hp. motor; model B24 has a heater capacity of 4800 watts and a ¾-hp. motor; and model C48 has a heater capacity of 7200 watts with a 1-hp. motor.

CLIPPER—Applicable to certain types of laminated and impregnated sheets, a clipper equipped with anti-friction bearings and powered by a combination clutch and magnetic drive has been produced by Merritt-Solem Corp., 118 S. Niagara St., Lockport, N. Y. Model C-300 clipper with lightweight knife is used for cutting continuous moving sheets at a rate of 300 strokes per minute, and control is achieved through manual push button, limit switch, photo cell, or remote control.

For heavy clipping, a heavy duty steel knife bar is used, operating at approximately 100 strokes per minute. All clippers are available in knife lengths from 54 to 132 inches.

PORTABLE VACUUM PUMP—Two models of a vacuum pump truck have been placed on the market by F. J. Stokes Machine Co., 5500 Tabor Rd., Philadelphia 20, Pa. Mounted on fabricated steel, the unit can be easily transported to any point where there is a need for a vacuum system. The pump can thus be available as emergency equipment for vacuum processing of a product, or to test pipelines, vacuum and storage chambers, and pumps and other equipment that must be vacuum tight. The smaller model handles more than 2000 cfm between 1 and 10 microns absolute pressure, the larger one more than 4000 cfm for the same pressure range. The 2000 cfm model, 147-E-10, consists of one Stokes Model 212-G "Microvac" pump, one Model 147-E-10 diffusion pump, one Model 211 high vacuum valve, and one ½-hp. hermetically sealed refrigeration unit with baffled cold trap coil. All auxiliary piping, valves, and electrical controls are also mounted on the unit's common base. Connection for the purchaser's manifold is a standard 10-in. pipe flange having a center line 42 in. above the floor. The steel base is equipped with self-locking leveling jacks.

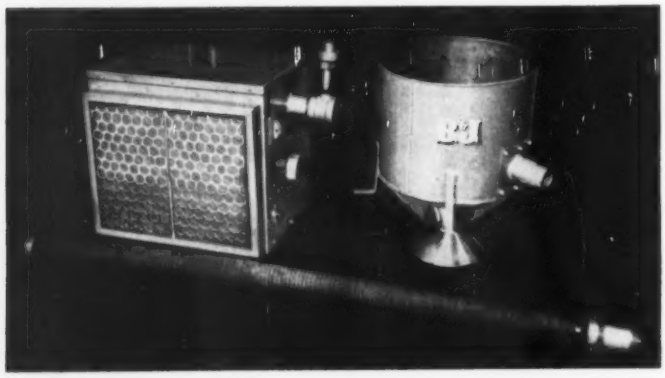
ABRASIVE BLASTING MACHINE—A new liquid abrasive blasting machine has been announced by R. W. Renton and Co., 790 Addison Rd., Cleveland 3, Ohio. The machine is designed to clean, finish, burr, blend, or etch a wide variety of molds, dies, tools, and other parts. The liquid slurry is drawn up by siphon injection and propelled from the blasting nozzle by means of a high-velocity air stream. The only moving part within the cabinet of the machine is the blower which is used to ventilate the cabinet.

Size of abrasive particles, concentration of abrasives in solution, distance between nozzle and work, and the supply of air pressure can be varied according to need. Work is inserted through an access door on the side of the water-tight cabinet, and the operator reaches in through gauntlet-protected arm holes. Work is held in one hand or placed on a work table, while the abrasive stream is directed by the other hand. Control over operation is exercised by means of conveniently placed padded knee pedals.

The Jet Blast machine comes in three standard and several custom designed sizes.

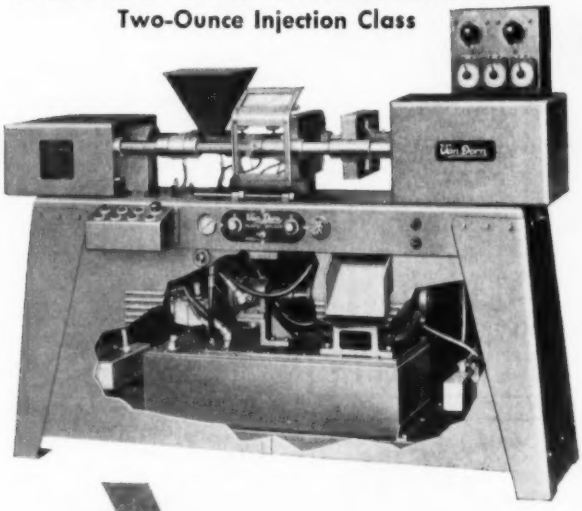
POWER SHEAR—Several new features have been added to the Jacques power shear, produced by Hobbs Mfg. Co., Dept. NMPL 1, 26 Salisbury St., Worcester 5, Mass. Among them are a number of pre-

Components of Ball & Jewell's heater-dryer hopper attachment; filter at top left, hopper attachment-heat spreader at right, and flexible hose at bottom

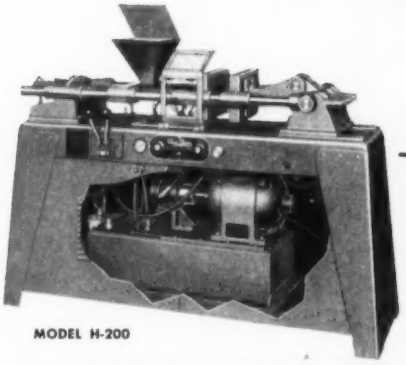


Produce Plastics Profitably With This
VAN DORN Equipment

Model H-200—Leader in the Semi-Automatic Two-Ounce Injection Class



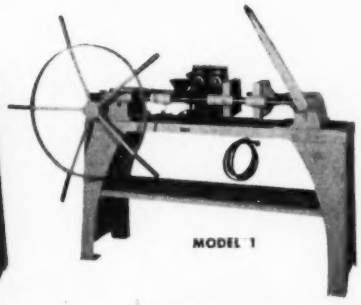
This ultra-modern press molds practically all thermoplastics including nylon. It completes up to 6 operating cycles per minute. Push button controls are safe, simple and convenient. Compact and rugged, the unit is quiet and economical in operation. Sliding gate with interlocking safety devices starts the cycle. Solenoid valves close the molds. Injection and dwell are controlled by first of three timers on the rear panel. Center timer regulates recharging of heater. The third timer controls the length of the mold close cycle; when time runs out, molds automatically open and parts are ejected. Operator opens safety gate, removes product and then closes gate to begin the next cycle . . . Variable voltage transformers in conjunction with thermostatic units control the temperatures on the two heating zones accurately.



MODEL H-200

Power Operated, Lever Controlled Presses

2-oz. or 1-oz. capacity. These low-cost units operate 8 hours for under a dollar and use inexpensive molds. Can easily be set up in twenty minutes by one man.



MODEL 1

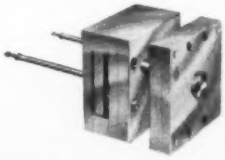
Manually Operated Press

1-oz. capacity. This press is ideal for smaller jobs, experimental work and technical training.

MODEL G-100

Plastic Grinder

Grinds up rejects, waste, etc., for re-use. Ruggedly made, designed for easy cleaning.



Mold Bases

Available from stock for all Van Dorn presses.

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THE *Van Dorn* IRON WORKS CO.

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cision controls and a slitting attachment.

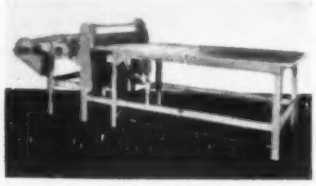
Basically, the instrument cuts or trims material, such as paper, laminations of paper and foil or of paper and plastic, sponge rubber, plastics film and sheet, and others to required length. The material may be hand fed through the cutting shears in sheet form, semi-automatically by hand, or fully automatically from rolls. Material in web form can also be handled in-process, as part of a continuous manufacturing or converting operation. The power shear can be equipped with slitting bars and cutters, so that material can be both slit longitudinally and cut to length in one operation.

The shear operates on power supplied through a Warner electric clutch and brake. The cutting head and upper knife operate on rigid ways, with gibs for full adjustment. Between the upper and lower knives adjustments can be made to fine limits and be held accurately.

Most important production application of the shear is installation of the machine with its automatic feeding, measuring, and take-away equipment in a continuous-process line operation.

When the machine is installed for semi-automatic operation in cutting material from a roll, the material can be fed by the operator manually bringing feed rolls together, the feed rolls being actuated by chain drive from the main motor. When the required amount of material for one

Power shear set-up for semi-automatic operation. Operator controls each cut as material reaches pre-set gage

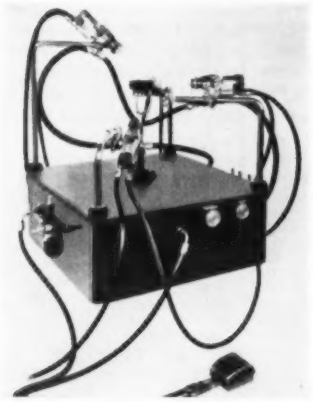


length has been fed by this method, the cutting knife is actuated by a foot switch. In automatic operation, the material is measured mechanically or electronically to within a few thousands of an inch, and the cutting head is actuated automatically. Automatic operation can be applied

both to cutting and to simultaneous slitting and cutting.

PORTABLE SPRAYER—An automatic single-spindle painting machine which, for short runs, eliminates the need for costly conveyorized painting systems, has been developed by Conforming Matrix Corp., 364 Factories Bldg., Toledo 2, Ohio. The machine can be used in most standard spray exhaust booths.

One dial regulates the spindle speed from 100 to 400 r.p.m., while



Conforming Matrix portable sprayer is started with foot pedal (foreground). Dials regulate spindle speed and length of spray time

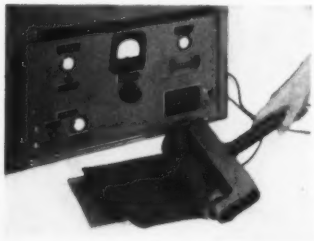
a second dial controls the length of time the spray guns operate. The spindle and guns go into action at the touch of a foot pedal, but stop automatically as predetermined by the dial settings. The speed of operation depends upon the required loading time, which in turn is controlled by the nature of the piece being sprayed and by whether masking devices are employed.

Provision is made for mounting up to four guns, one in each corner, as required to cover the work. The work holder is designed to serve also as a masking device when masking is required.

POROSITY DETECTOR—A device which provides a safe and effective means for detecting and recording minute holes in any material which is electrically non-conducting has been perfected by Viking Instruments, Inc., East Haddam, Conn. Based on

the principle that porosity in such material may be detected by the application of a voltage sufficient to arc across the air gap which exists if there is a hole, the standard type PR can test materials up to 0.040 inch. A modification of the standard model permits tests on materials up to ⅛ in. thick. To avoid damage to the material being tested, the current used in the instrument is kept sufficiently low to avoid burning the holes in the testing process and thereby enlarging them.

In the testing procedure, one side of the material to be tested is arranged to make contact with a roller or plate, which is grounded. A second roller, which is electrically connected to the high potential source, is then brought into contact with the other side of the material being



Viking's porosity indicator in operation. The roller is electrically connected

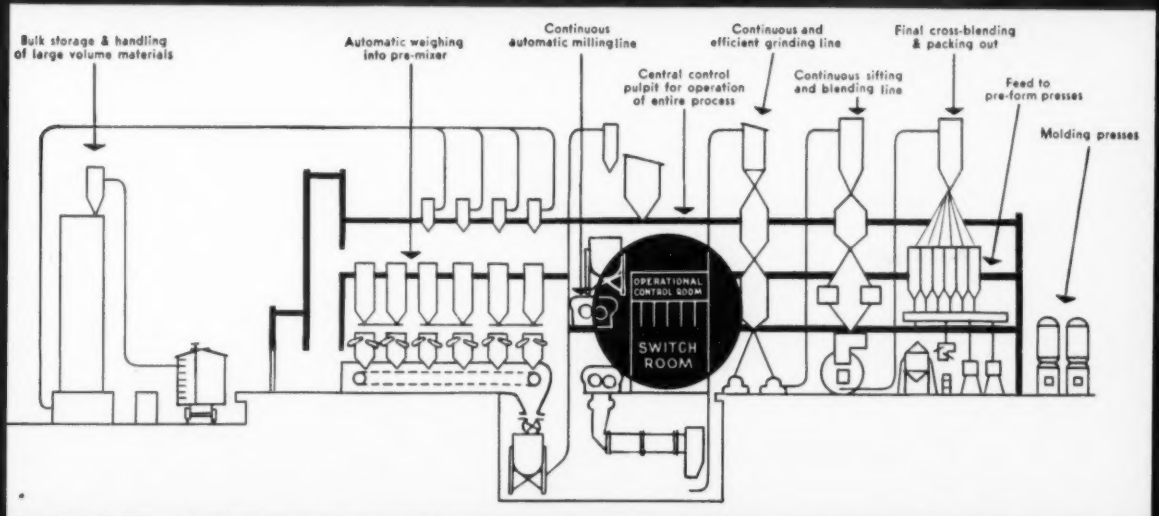
tested. Thereafter, during the test period, whenever a hole in the material passes between the grounded and the electrically connected rollers, an indicating device is actuated. This may be a visual or audible signal, a counter, or a web marker.

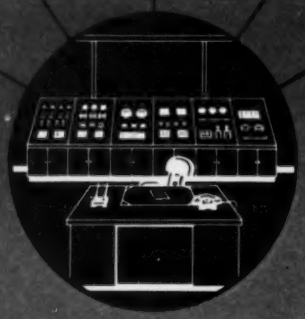
The unit also contains safety features for operating personnel. While the current never exceeds 50 microamperes—though the potential may be as high as 5000 volts—the voltage automatically falls to a low level when the operator touches any high-potential part of the instrument.

TURNING MACHINE—Model 1000 wood and plastics turning machine, produced by Hawker Mfg. Co., 1425 Keowee St., Dayton 4, Ohio, has the following features: variable feed and cutter head speed controls; self-centering and equalizing stock guides; blower-type shaving hood, and a drive system eliminating the clutch and many gears and shafts.

"Push Button"

PHENOLIC MOLDING POWDER PLANT





From the console platform, one man controls automatically the output and quality. Here is a real, streamlined phenolic molding powder plant with many innovations and features. This Phenolic Molding Powder Plant has aroused great interest in the industry. It represents the combined experience of several of the nation's top plastics specialists . . . men who work for this organization.

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National Erie Products for the Plastic and Rubber Industries • Extruders • Simplex Doors for Autoclaves • Mills and Hydraulic Presses.

This old and well-known line of machinery was acquired March 1, 1952, by The Aetna-Standard Engineering Company. They are manufactured in their Warren, Ohio, and Ellwood City, Pa., plants. The sales and engineering of the National Erie line is the responsibility of Hale and Kullgren, Inc., Akron, O.

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THE AETNA-STANDARD ENGINEERING CO.
PITTSBURGH, PA

Plants in Warren, Ohio
Ellwood City, Penna.

BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Glycerol," edited by Carl S. Miner and N. N. Dalton.

Published in 1953 by Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. 460 pages, Price $12.00.

This is the first book on the subject of glycerol since 1932 when Schlenker published his "Das Glycerin." The advances which have been made since that time in the technology of recovering and refining glycerol, and the commercial synthesis of glycerol from propylene are discussed in this volume. The authors also treat the major uses of the compound, present up-to-date information on its properties, and cover the latest methods of analysis. All this has been combined with older information on the subject which is still pertinent today, making this a fairly definitive monograph. Specifically, the volume, starting with a historico-economical survey of the natural sources of glycerol and their prevalence, goes into the various methods of production, gives a summary of standards and specifications, outlines the physical and chemical properties as well as the derivatives of glycerol, and enters into a discussion of its biochemical uses. Chapters on the physiological actions of glycerol and on commercial applications of the compound complete the volume. One in the series of American Chemical Society monographs, the book has been designed to be of interest not only to glycerol producers and refiners, but also to research chemists and executives in those fields where glycerol plays an important part.

"Submicroscopic Morphology of Protoplasm," by A. Frey-Wyssling.

Published in 1953 by Elsevier Publishing Co., 402 Lovett Blvd., Houston, Texas. 411 pages. Price $8.00.

While the first English edition of Professor Frey-Wyssling's monograph on the submicroscopic structure of protoplasm dealt primarily with a validation of theories developed prior to the introduction of the electron microscope, this second edition concerns itself basically with the results of electron microscope investigations. Brought up to date, it includes all major developments in the field of submicroscopic morphology which have taken place since 1948. Fully illustrated, this volume is written for the student rather than for the established specialist in submicroscopic morphology.

"Chemical Analysis of Industrial Solvents," by Morris B. Jacobs and Leopold Scheflan.

Published in 1953 by Interscience Publishers, Inc., 250 Fifth Ave., New York, N. Y., 502 pages. Price $10.00.

Although the utilization of chemical solvents in industry has grown tremendously since the beginning of this century, no overall summary of developments and methods in this field has been available in chemical literature. The present volume, No. 7 in the series of "Chemical Analysis," is an attempt to fill this gap. Using the three major aspects of solvent analysis—assay of a given solvent, analysis of mixtures of solvents, and identification of unknown solvents—as a framework, the authors first enter into a detailed methodological discussion of analysis procedures. Included here are the numerous tests which have been worked out for solvent analysis, presented in precise step-by-step fashion, in addition to some basic theory and apparatus problems. Evolving from the general statement on method, the book then proceeds to deal primarily with analysis tests of specific solvents—and manages to cover most of those in industrial use today. To cite but a few of the solvents discussed, the work deals with such major groupings as benzene, aromatic and hydrocyclic hydrocarbons, halogenated hydrocarbons, alcohols, glycols, ethers, acids and esters, and many others; and, of course, with the numerous compounds found in each of those major classifications. For example, under chlorinated hydrocarbons are listed analytical tests and specifications for dichloromethane, chloroform, carbon tetrachloride, ethylene dichloride, tetrachloroethane, chloropene, and various other compounds in that family. The present monograph stresses the practical aspects of solvent analysis and should be of primary interest to the chemical engineer and research worker in that field.

Acrylic signs—Of interest to manufacturers and users of signs, this 24-page booklet illustrates the numerous ways in which Plexiglas can be employed to produce signs and displays. The booklet is fully illustrated in color and covers signs ranging from dealer identification types used in quantity by national manufacturers to custom designed displays for single locations. The brochure is titled "Plexiglas—the Outdoor Plastic—for Signs." *Plastics Dept., Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.*

N-methylglucamine — A technical data sheet on the experimental compound N-methylglucamine is now available. Detailed information is given on the physical and chemical properties of the material as well as on suggested uses. *Commercial Solvents Corporation, 260 Madison Ave., New York 16, N.Y.*

Temperature control—A revised 24-page manual, "Industrial Temperature Measurement and Control," presents the basic principles of the subject. It discusses the different responses to temperature, indicates ways in which these responses can be put to work, and lists the company's line of control equipment and instruments. Also treated are such topics as the influence of the firing system upon design of the control system, fundamental principles of mercury bulb installations, and the basic concepts of electrical and mechanical control theory. *Partlow Corp., New Hartford, N. Y.*

Engineers needed—In an effort to focus the attention of management on the problem of recruiting a sufficient number of engineers into industry in order to alleviate the current and prevent a future shortage, this 26-page booklet offers sugges-

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tions on the use of the different media of communication to develop in the youth of this country a greater interest in the field of engineering as a profession. Suggestions contained in "How your Company can Help Promote Engineering as a Career" include use of institutional display ads, publication of feature stories dealing with this subject, radio spots, editorials, and news releases. *The Advertising Council, Inc., 25 West 45th St., New York 36, N. Y.*

Polyethylene—Information about the properties, applications, and methods of fabricating polyethylene is set forth in this revised 24-page booklet entitled "Bakelite Polyethylene." Discussing the increased use of polyethylene for squeezable bottles and of their fabrication by blow-molding, the booklet also covers packaging and houseware applications of the material, as well as its use, in pipe form, for water service, wiring conduit, and mine and chemical piping. Two new data tables show permeability of polyethylene film to oxygen and carbon dioxide and its water vapor transmission rate as compared to other materials. Other data tables cover average properties of molding and electrical compounds, polyethylene resin compatibility, chemical resistance and swelling properties, and the shelf life of California iceberg lettuce packaged in polyethylene and other film. *Bakelite Co., Div. of Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, N. Y.*

Diabasic acid—Azelaic acid, a C_9, saturated, diabasic acid, is discussed in Bulletin No. 40, which contains a description of the acid, including tentative specifications, typical characteristics and reactions, and composition data. The acid is produced by an ozone oxidation process—rather than by the chromic acid method—which, it is claimed, will reduce the selling price of the acid. *Emery Industries, Inc., Dept. 5, Carew Tower, Cincinnati 2, Ohio.*

Miniature tubing—A general catalog, describing the company's line of miniature and subminiature metal tubing for use as component parts of transistors and other advanced electronic equipment, shows the following specification ranges: Outside diameters from 0.48 to 0.010 in., walls down to 0.0010 in., and tolerances of 0.00025 in. *Uniform Tubes, Inc., 1220 Level Rd., Collegeville 2, Pa.*

Silicone rubber insulation—The properties and processing of silicone rubber as insulating material for wire and cable are discussed in Bulletin CDS-13. A section on applications deals with the use of the heat- and flame-resistant material for Navy and ignition cable. *Chemical Div., General Electric Co., Pittsfield, Mass.*

Chemical firm—A 24-page revised edition covers the company's products, facilities, and background. It presents the organization's 20-year history, its financial position, and its operations. A discussion of plant site, personnel, building space utilization, equipment, and research facilities is also included. For those who have the previous edition of this booklet, a revision sheet is available. *Edwal Laboratories, Inc., Ringwood, Ill.*

Recording-control instruments — Catalog ND44(1) describes the design and construction features of the

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PX-238 DiOctyl Adipate
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strip-chart Model S Micromax Recorder. The recorder is used for the continuous measurement and control of key process variables, deviations in which can be converted into a measurable change in electrical potential or resistance. These variables include such quantities as temperature, humidity, pressure, speed, smoke, specific gravity, electrolytic conductivity, acidity, voltage, power, etc. The instrument indicates operating trends on a continuous chart and permits analysis of completed operations by providing permanent filing data for reference. *Leeds & Northrup Co., 4907 Stenton Ave., Philadelphia 44, Pa.*

British plastics machinery—Fifty years of experience in manufacturing are behind the production of 2- to 24-oz. injection molding machines and molds offered by The Projectile and Engineering Co. Ltd., England. These machines and molds are described and illustrated, both under construction and in use, in a 24-page brochure entitled "Plastics Machinery Division." Also available is a brief historical report of the company, "Fifty Years of Achievement." Request literature from the company's representative, *The Kingham Advertising Agency Ltd., 59 Baker St., London, W.1., Eng.*

Control instruments—Catalog 1530, "ElectroniK Controllers," contains detailed specifications and control-action descriptions and ratings for electric and pneumatic controllers and electric control relays. *Minneapolis-Honeywell Regulator Co., Brown Instrument Div., Station 64, Wayne and Windrim Aves., Philadelphia 44, Pa.*

Industrial pipe—Applications of new "Screw-Seal" clay pipe using phenolic collars and cast-on threads of plastisol for tight acid-resisting joints are described in an illustrated folder. Also available is a six-page bulletin with complete installation instructions. *The Robinson Clay Product Co., 65 W. State St., Akron 9, Ohio.*

Synthetic rubber compound—Four-page bulletin 96-B describes physical, electrical, and chemical properties of the heat and chemical resistant hard rubber compound Tempron. Based on Buna-N, the formulation can be tailored for specific applications. Material is available in molded parts, sheet, rod, and tubing, and standard pipe and fittings. *The American Hard Rubber Co., 93 Worth St., New York 13, N. Y.*

Research equipment—A line of apparatus and equipment for paper partition chromatography is presented in this 16-page catalog (Feb. '53). Also included are listings of other instruments used in research, development, and control laboratories, such as electrophoretic equipment, polyethlene laboratory ware, desiccating cabinets, thermo-wall ovens, and others. *Schaar & Co., 754 W. Lexington St., Chicago 7, Ill.*

Rigid plastic pipe—Applications, joining data, and specifications for standard and extra-heavy pipe in sizes ½ to 2 in. are presented in a 4-page booklet called "L Rigid Plastic Pipe." Dimensional drawings and descriptions of pipe fittings are given, and a newly developed compression coupling is covered in detail. Applications are suggested for handling natural gas, oil petroleum derivatives, and other corrosive substances. *Carlon Products Corp., 10225 Meech Ave., Cleveland 5, Ohio.*

Rubber-covered rolls — Natural-, Buna S-, Buna N-, and Neoprene-covered rolls of various hardnesses are described for use by paper, leather, textile, plastics, abrasives, and miscellaneous industries. Characteristics and applications of respective types are discussed. Catalog folder also includes chart for listing specifications data. *Industrial Roll Div., Tyer Rubber Co., Andover, Mass.*

Petroleum resin—Physical and chemical properties, as well as suggested applications of "Piccopale," a 100% polymerized petroleum resin, are described in this 12-page folder. Available solid, flaked, or in solution, the compound has wide industrial utility. It may, for instance, be used as a size for wool carpets and rugs; as a binder in linoleum; as a softener in rubber tile; as a coating for waterproofing outer garments; for stiffening compounds for caps, cards, straws, fillers, and boards made from paper; as a compounding aid for plastics and rubber; as an ex-

tender, carrier, and adhesive in the compounding of insecticides and fungicides; and as an organic thixotropic agent in drilling muds for petroleum exploration. The compatibility of the material with a large variety of compounds gives it a wide potential range of applications. *Harwick Standard Chemical Co., 901 Broad St. Bank Bldg., Trenton 8, N. J.*

Primer coating resins—Production Information Bulletin No. 72 discusses properties and applications of Butvar, a polyvinyl butyral resin. Used as primer coatings for outside metal equipment, Butvar is also finding extensive application in coating formulations for can liners, penetrating wood-finishing sealers, and knot sealers for wood. Suggested formulations of the material are also available. *Monsanto Chemical Co., Plastics Div., Springfield, Mass.*

Standardization—Entitled "Standards—Engineering Tools for Industry," this 64-page volume reports on the standardization conference held last September in conjunction with the Centennial of Engineering and on the principal addresses presented at the American Standards Association's 34th Annual Meeting Award Luncheon held November 25 in New York. The papers included were presented by William L. Batt, formerly president of SKF Industries, Inc. and recently Minister of Economic Affairs to the United Kingdom; Roger E. Gay, president of The Bristol Brass Corp.; Colonel Willard T. Chevalier, executive vice-president of McGraw-Hill Publishing Co.; and Joseph W. Barker, president of the Research Corp. They featured standardization experience and practices in industrial construction and home building, chemicals, safety, purchasing, photography, welding, and in the international field. Price $2.00. *American Standards Association, 70 E. 45 St., New York 17, N. Y.*

Reinforced plastics—Polyester resins are discussed in an 18-page illustrated booklet entitled "Polyester Resins for Reinforced Plastics." Scope of the volume covers the nine BRSQ resins. Starting with a summary and table of properties, it continues to production and fabrication of reinforced plastics. Special attention is given to formulation, including fillers, catalysts, accelerators, colorants, thinners, and solvent additives. Separate sections deal with compounding techniques, reinforcement materials, and production methods, including diagrams of diaphragm, rubber plug, and matched metal die techniques. *Bakelite Co., Div. of Union Carbide and Carbon Corp., 30 E. 42 St., New York 17, N. Y.*

Polyesters—Industrial applications, catalysts, fillers, pigments, and principal fabricating methods for polyester resins are covered in a 24-page bulletin, "Polyester Resins." Complete property data are offered on six resins in more than 20 charts and tables. *General Electric Co., Chemical Div., Pittsfield, Mass.*

PVC resins—Manuals for two recently introduced polyvinyl chloride resins list physical properties, compounding, processing, forming, and formulation data. For additional aids in formulation and processing, a listing of materials suppliers is included. *Goodyear Tire & Rubber Co., Chemical Div., Akron 16, Ohio.*

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Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant for transfer to other plants

PLASTIC AND SYNTHETIC RESIN PRODUCTION IN 1952
From Statistics Compiled

Materials	*Total p'd'n. 1952* **	*Total sales 1952* **
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, under 0.003 gage	10,886,970	11,443,984
0.003 gage and over	10,067,449	9,854,504
All other sheets, rods, and tubes	5,239,438	5,018,275
Molding, extrusion materials	59,279,463	58,624,095
Nitrocellulose:		
Sheets	5,143,495	4,508,454
Rods and tubes	877,776	981,574
Other cellulose plastics[b]	6,653,214	6,475,871
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	68,947,334	44,633,493
Adhesive	42,753,907	39,882,753
Molding and casting materials[a]	172,115,976	158,530,973
Protective coatings (modified and unmodified except by rosin)	26,689,526	23,557,726
Miscellaneous uses	65,776,828	60,408,721
UREA AND MELAMINE RESINS:		
Adhesives	79,264,610	79,243,044
Textile-treating resins	33,252,372	31,718,893
Paper-treating resins	23,620,653	23,389,450
Protective coatings, modified and unmodified	24,123,565	19,196,081
Miscellaneous uses, including laminating and molding[c]	58,525,452	62,400,027
STYRENE RESINS:		
Molding materials[a]	272,216,847	248,856,462
Protective coatings, modified and unmodified	68,666,968	68,210,052
Miscellaneous uses	72,090,197	63,804,707
VINYL RESINS:[d] Total	431,057,056	408,131,792
Sheeting and film (resin content)[e]		154,901,746
Adhesives (resin content)		17,286,688
Textile and paper-treating resins (resin content)[f]		42,298,130
Molding and extrusion materials (resin content)		140,872,444
Protective coatings (resin content)		20,979,499
Miscellaneous uses (resin content)		31,793,285
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS:	175,668,427	175,333,359
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a,g]	105,195,183	99,499,219
Protective coatings[h]	21,870,377	24,528,132
All other uses[i]	107,584,277	103,279,571

* Dry basis is designated unless otherwise specified. ** Total sales and production figures for 1952 have been adjusted and revised to compensate for errors and incomplete returns made during the year. [a] Includes fillers, plasticizers, and extenders. [b] Includes sheets, rods, and tubes, and molding and extrusion materials. [c] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [d] Production statistics by uses are not representative, as end use may not be

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

POUNDS* FOR NOVEMBER AND DECEMBER 1952 by U. S. Tariff Commission

November 1952		*December 1952*	
Production	*Sales*	*Production*	*Sales*
950,182	1,113,191	1,136,543	1,186,092
989,221	943,803	1,126,690	1,067,449
405,195	366,475	395,800	427,046
5,628,882	5,945,328	5,779,979	5,344,656
416,211	398,300	463,677	451,314
90,009	61,232	92,066	79,835
529,144	482,491	456,443	541,623
6,987,846	4,417,417	6,590,860	4,533,015
3,784,693	3,625,902	3,526,824	3,469,704
18,615,537	17,500,562	17,061,377	17,809,366
2,657,675	2,157,638	2,352,941	2,429,714
6,150,452	5,764,892	7,294,892	6,550,828
6,569,962	6,548,112	8,144,941	8,423,516
3,027,870	2,662,481	2,947,762	2,839,444
2,590,685	2,211,872	2,239,202	2,644,562
2,623,606	2,009,497	2,505,704	1,921,639
6,126,324	6,133,661	7,140,720	6,549,569
31,289,859	26,649,557	29,433,004	27,328,393
5,918,496	5,788,926	6,265,806	6,765,412
7,224,905	6,383,179	7,609,671	6,188,843
39,880,637	38,116,094	41,653,642	38,093,953
	13,666,214		12,873,868
	1,655,782		1,586,864
	3,931,758		3,483,050
	13,955,637		14,763,506
	1,787,734		2,020,174
	3,118,969		3,366,491
15,479,194	15,845,757	16,104,328	14,846,934
9,617,857	8,885,673	10,949,644	10,068,590
1,797,452	1,976,625	1,676,315	2,315,880
11,655,788	10,698,813	10,975,769	10,451,607

known at the time of manufacture. Therefore, only statistics on total production are given. [a] Prior to January 1951, statistics were given on the basis of total weight. [c] Includes data for spreader and calendering-type resins. [g] Includes data for acrylic, polyethylene, nylon, and others. [h] Includes data for epichlorohydrin acrylic, polyester, silicone, and other protective coating resins. [i] Includes data for acrylic, rosin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

Three kinds of *exclusive* finishing materials are now available generally

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for the barrel surfacing of plastics, wood and metal parts. The granules are of porous stone impregnated with a special bonding and lubricating compound. Their use prevents formation of dust and protects the material from abrasions. The granules can be reimpregnated after a period of use.

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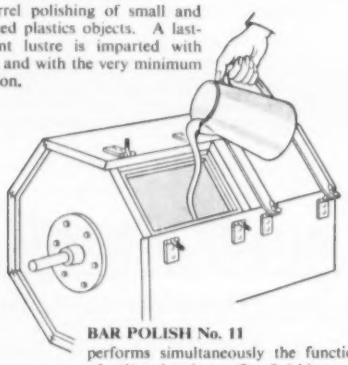

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performs simultaneously the functions of (1) abrasion, (2) finishing and (3) glossing. It is fast in action and not only saves time but results in considerable economies in the replacement cost of mops.

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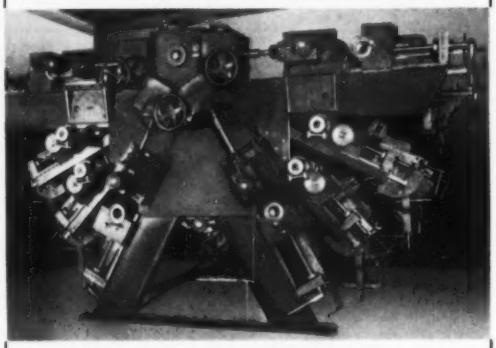

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Styrene copolymer print washer tub resists chemicals, will not corrode

Print Washer

DESIGNED for the professional photographer's darkroom, a print washer formed of styrene copolymer is wide and deep enough to easily accommodate a large number of prints. Measuring 30 in. in diameter and approximately 8 in. in depth, the unit, which is manufactured by Richard Mfg. Co., Van Nuys, Calif., can handle 125 or more 8- by 10-in. prints.

The circular tub-shaped body of the washer, the three short legs on which the unit stands, and the central drain are all formed of Royalite styrene copolymer.

Formed ribs and ridges along the sides and bottom of the tank add extra strength to the unit and prevent wet prints from sticking to the inside surfaces. Despite the many gallons of water and the variety of chemicals that are commonly used in the darkroom, the Royalite washer will not rust or corrode.

To insure each individual print being thoroughly washed, three streams of water are played into the tank. The first plays over the top surface and keeps all floating prints under water; another separates the prints with a stream of bubbles; and a third forces the water to travel faster through the prints.

The water level can be controlled by adjusting the height of the drain hose. The Royalite-formed drain, through which the water passes out into the hose, is shaped like an inverted cup and is located in the center of the sloping bottom. A detachable Royalite half-cover to prevent splashing is supplied with each print washer.

The washer is also available in an 18-in. diameter model. The half-cover on this model is styrene.

Phenolic and Styrene in Grinding Wheels

ABRASIVE wheels in which carefully graded abrasive grains are bonded with phenolic resin have an exceptionally strong structure, will run cool in heavy service, and are safe to operate at high speeds demanded in modern industrial production processes.

Such wheels are now being produced by a modernized process at Simonds Abrasive Co., Philadelphia, Pa. Bakelite phenolic is used for the bonding agent and Bakelite styrene modified with rubber is injection molded into the centers of the grinding wheels to form the arbor holes. The rubber modified styrene has high impact resistance and its light weight reduces the danger of producing unbalanced wheels. The rubber-modified styrene replaces lead. Lead weighs approximately 11 times as much as the rubber-styrene and even small build-ups tend to create an unbalanced wheel which may be dangerous to operate at high speeds.

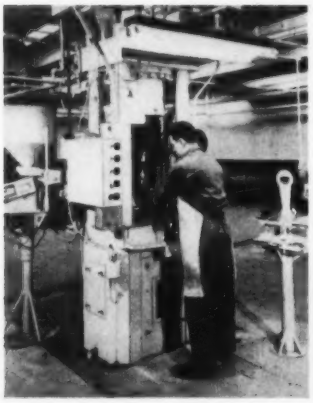
In the high-speed production method used in the Simonds plant, the abrasive particles are screened to size, blended with the phenolic bonding resin, and formed into shape in compression molding presses.

These presses are used to produce wheels ranging up to 36 in. in diameter and 12 in. thick. The wheels are formed cold under a pressure of about 2000 p.s.i. After forming, the shaped wheels go to a three-stage curing oven. In the first stage the temperature is slowly raised from 200 to 330° F. over a period of 24 hours. In the second stage, also of 24 hr. duration, the temperature is held at 360° F. Final stage consists of a period of from 5 to 6 hr. of steady cooling.

In the injection molding of the styrene arbor hole lining the grinding wheels are mounted as female molds on standard injection molding machines. The male mold determines the size of the arbor hole.

Rugged phenolic-bonded abrasive wheels are safe to operate at high speeds

Up to 15 ten-in.-diameter wheels per min. are molded in automatic press



To injection mold arbor holes, the grinding wheel is mounted as female mold

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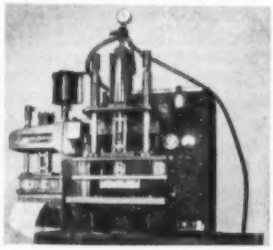
Mayflower also manufactures power generators and presses, including dual generators for high production heat sealing operations not requiring custom specifications.

While standard equipment can often be used for sealing plastics, this Mayflower generator (right), with 2 specially designed presses, provides greater efficiency and economy.



Mayflower ELECTRONIC DEVICES Inc.

Only Manufacturer of both Bar and Rotary Electronic Heat Sealers

UNion 3-7100

6014 Hudson Blvd. West New York, N. J.

BAKER

Manufacturers of 30 Ton Automatic Compression Molding Machines with Minimum Lost Cycle Time.

BAKER BROTHERS, INC., Toledo 10, Ohio
PRODUCTION MACHINERY . . . SINCE 1867

Tumbling vs. Rolling

IT IS well known that drummed granular molding compound, which is composed of a certain amount of fines mixed with the granules, (normally $\frac{5}{16}$-in. granulation), has a tendency to separate out somewhat during transit with the fines drifting toward the bottom of the drum. If such material is pre-formed by the molder without effective blending, there is a definite possibility that the preformed material may not be of uniform weight, thus reducing molding efficiency.

The Bound Brook Laboratories of the Plastics and Resins Div., American Cyanamid Co., undertook an investigation of the most effective means of uniformly re-distributing the fines in a delivered drum of granular material. Two of the methods investigated were: 1) simple rolling of the drum and 2) end-over-end tumbling. The procedures which were used in these investigations were as follows:

The 110 lb. Leverpak drums were $\frac{4}{5}$ filled with white Beetle granular molding compound. To both drums had been added, at various levels, one pound of contrasting colored granular Beetle (i.e., red on the bottom, black in the middle, and blue on top). One drum was rolled for 5 min., while the other was mechanically tumbled end over end for the same period of time. Then each drum was held in a practically horizontal position and thief samples taken. Finally, three 4- by $\frac{1}{8}$-in. disks were molded to determine the concentration of each color at the three levels within the drums.

An examination of the molded disks made it quite apparent that the tumbling operation resulted in a uniform dispersion of the stratified material, as shown by a uniform color dispersion in each of the three disks. The disks molded from the *rolled* material at the three levels indicated that this blending effort was ineffective.

It is concluded that the tumbling of drums is far superior to rolling as a means of restoring the uniformity of material after shipment, and it is therefore recommended that this method be employed to achieve such uniformity.

Tile Kit

IN line with the nation-wide trend towards application of plastic wall tile by home mechanics, S & W Moulding Co., Columbus, Ohio, has introduced a packaged "do-it-yourself" installation tool kit for use by amateur home-builders and decorators.

Included in the handy, over-the-counter kit is all the equipment necessary for installing tile—notched trowel, coping saw, tape measure, level, chalk, and chalk line.

A simply written instruction booklet explains the quickest, most economical method for using the tools in the application of the tile to the wall surface.

An entire wall can easily be covered in a short time. The level is first used to locate the lowest point

Kit for installing plastic wall tile includes coping saw and notched trowel

of the floor, since that will be the spot from which the measurement for wall height is taken. Pre-determined dimensions are then measured off and carefully chalked on the wall as a guide.

When all measurements have been completed, the adhesive is troweled on and the tile squares pressed in place at all four corners. For irregular corners or those spots where the tile must go around a pipe, the squares can easily be sawed to exact size and shape to give a good and snug fit.

By carefully using the tools and following instructions, the tiled wall will be a permanent, attractive, and professional-looking installation. In contrast to today's high labor costs, the only investment necessary on the part of the home workman is the tool kit and a few hours of his evening or week-end time.

Lightweight, transparent ice cream containers are molded of durable styrene

Ice Cream Pack

THE visibility appeal of ice cream, inherent in the product and ordinarily hidden in opaque cartons, has been brought into the open by the use of clear styrene containers.

The attractive package is particularly suited for promoting impulse-buying in self-service retail outlets. By arranging the transparent one-pint containers side-by-side, the contrasting colors and the rich, frosty appearance of the ice cream create an effective, tempting display.

As a further purchasing incentive, the tapered cylindrical containers may be re-used for many purposes. Since the 0.04-in. walls can expand and contract uniformly without cracking under temperature change, the containers are ideal as utility jars in home freezers. They can also be used for storing leftovers or packing lunches.

A self-sealing slip-on cap provides a tight cover that will not jar loose.

The light-weight container is easy to handle and will nest compactly to save storage space. Embossed on the top of the lid is the name of the company and the product. An adhesive label, also on the lid, identifies the brand name and flavor.

The re-usable transparent containers are molded by Mutual Plastic Mold Co., South Gate, Calif., using Monsanto's and Dow's styrene, for Golden State Co., Ltd., San Francisco, Calif.

Acrylic model shows how thread inserts are used in phenolic insulating block

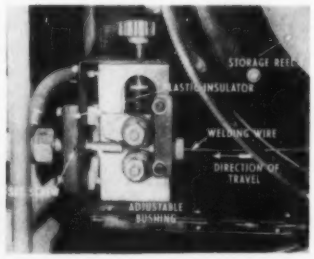
Thread Inserts

TAPPED threads in a laminated phenolic insulating block are protected with stainless steel Heli-Coil wire thread inserts.

As a key component in the wire-feed section of an automatic welding unit of the Air Reduction Co., Inc., Murray Hill, N.J., the phenolic-laminate block serves a three-fold purpose: 1) as a support for the adjustable bushing through which a continuous welding rod passes; 2) as insulation for the current-carrying welding wire; and 3) as a means of providing lateral adjustment to accommodate different sizes of welding wire.

Each insulator block contains three of the Heli-Coil thread inserts. The two smaller set-screw threads, which are located at either side of the block, will not strip under high torque loads and are virtually impervious to wear. The larger insert, which accommodates the adjustable bushing, is located in the center of the block and serves, in addition to its protective features, as a brake band type lock around the threads of the bushing.

Threads for adjustable bushing and set screws are protected by wire inserts



Versatility

Vinyl Compounds

The versatility of vinyl dispersion compounds lend themselves to many wide and varied applications. The "know-how" of the Watson-Standard laboratories can adapt these products to your specific production and end uses.

Molding:

Watson-Standard Vinyl Plastisols and Rigidisols are applicable to both slush molding and dip molding. Such items as doll and doll parts, toys, spark plug covers, electrical components, novelties, puppets, toilet valves, boats, light sockets and others are illustrations of this type of application.

Dipping:

Watson-Standard Vinyl Organosols and Plastisols are readily applied by dipping. Varied end products include dishwasher baskets, dish racks and drainers, electrical wiring, gloves, and springs for the automotive and upholstery industries.

Spreading:

Watson-Standard Vinyl Plastisols and Organosols may be spread coated. Coated textiles and paper are typical of this type of application.

Spraying:

Special foundations of Watson-Standard Vinyl Organosols and Plastisols may be applied by spraying. Finishes for metal furniture, cabinets and blowers are representative uses.

Casting:

Since Watson-Standard Vinyl Plastisols are in liquid form and may be readily poured, they lend themselves to casting. Casting applications include films, sealants for automotive and refrigeration industries, ceramic pipe joint threads, and potting compounds.

Troweling:

Watson-Standard Vinyl Plastisols may be formulated for troweling. This type of application lends itself to linings for tanks and sealants.

The Watson-Standard laboratories can formulate specific compounds for your special end uses and applications. Send us your problem.

Watson-Standard CO.

225 GALVESTON AVE., PITTSBURGH 30, PA.

NEW YORK OFFICE: 15 Park Row, New York 38, N. Y. • CHICAGO OFFICE: 55 E. Washington St., Chicago 2, Ill.

PLASTICS • INDUSTRIAL FINISHES • CHEMICALS

Bathroom Set

TEXTURED vinyl sheet is being used to fabricate toilet lid covers and matching contour rugs, recently introduced by Vinyl Linens, Inc., New York, N.Y. These easy-to-clean vinyl accessories were designed to help mothers solve little boys bathroom training problems but are functional for adults as well as children.

They are available in a wide range of decorator colors and hence can easily be matched with towels, wall tiles, or paint.

The texture selected for this application is a rope design which is deeply molded into the flexible plastics sheet by the Forrest process, which produces fine or bold detail in a three dimensional effect. Because the formed or molded design goes through the entire thickness of the sheet, air trapped under the rug acts as an efficient thermal insulator. The full-bodied rope design also serves as a cushion for bare feet.

The rope design is used on the top surface of the lid cover while the bottom surface, visible when the lid is raised, has a smoother design in a matching color. A Flextite plastic closure assures a tight fit. The fastener is simply two strips of flexible fastener with interlocking tracks which, when pressed together with the fingers, grip tightly until pulled apart. The Flexible closure is a development of the Flexigrip vinyl slide fastener.

Vinyl toilet lid cover and contour rug are molded with colorful rope design

Tough phenolic connector (top, right) accommodates trailer park cable (bottom)

Connector Unit

TRAILER-COACH appliances work more efficiently on the increased current supply carried by a new heavy-duty connector molded of impact-resistant phenolic.

The tough, electrical insulating phenolic connector also resists moisture and abrasion. It is produced by Theodore Bargman, Detroit, Mich., using material supplied by Bakelite Co., Div. of Union Carbide and Carbon Corp.

The connector unit in the trailer body has three heavy-duty, brass bus-bar terminals which carry over 30 amperes at 110 volt.

When not in use, the polarized male receptacle that faces to the outside of the trailer is protected against the weather by an automatic locking cover. To connect the receptacle to the trailer park end of a cable, the cover is lifted and the female cable plug fitted onto the connector. Once the two are locked together, the cover springs back to securely hold both sections of the connector unit in place.

Cable clamps on both plugs are adjustable to fit variations in cable diameter. All plugs and receptacles provide an extra terminal for ground wire to make the trailer electrically safe.

A portable adapter is also available to convert the three-terminal plug to a two-terminal receptacle, with ground, in trailer parks not equipped with three-terminal power supply.

Plastic Tapes

(*Continued from pp.* 73-79)

films used in pressure-sensitive tapes. They are available in three different forms—acetate fiber; acetate cloth; and acetate film—each of which has its own particular advantages.

Acetate fiber backing consists of a sheet of acetate film laminated to a thin sheet of paper impregnated with a latex formulation for added strength. The resulting thin-gage tape, measuring only 6.5 to 7 mils, has a tensile strength of 34 lb. per in. of width, fairly high tear resistance, and is moisture-resistant. The tape is particularly applicable for packaging and meets government specifications for overseas shipment packaging, Jan-P-127, Types III and IV, Grades A, B, and C. It is also used as a moisture-resistant attractive closure and seal for cans, cartons, cannisters, and boxes.

By adding bright color pigments to the laminating adhesive, the acetate fiber makes an ideal tape for color identification. It is included in Government specification L-T-101 for color coding and protective use.

Manufacturers of acetate fiber tapes are Industrial Tape Corp. and Minnesota Mining and Mfg. Co.

Acetate Cloth

Woven acetate cloth tape combines a high dielectric strength with a conformability which far exceeds that of any of the fabric tapes. The combination is ideal for wire insulation, particularly where high temperatures are encountered and maximum resistance to corrosion is an important factor. A typical 8.5-mil tape, being made by Industrial Tape Corp., has an electrical resistance of 50,000 megohms at 96% relative humidity.

Cellulose acetate cloth tape has an approximate elongation of 20% and a tensile strength of 40 lb. per in. of width. The tape conforms snugly to irregular surfaces and is adaptable for the difficult job of insulating and moisture proofing fine wire connections in transformers, coils, solenoids, and relays where wire coatings have been removed.

Color dyeing the tape tends to lower its corrosion-resistance properties. A white acetate cloth tape, manufactured by Bauer & Black, showed a reading of 250 micro-micromhos when subjected to A.S.T.M. D-1000-48T—the conductance method for indirect measurement of electrolytic corrosion. The same cloth, dyed black or brown, showed a reading as high as 1500 micro-micromhos.

The colored tape has an attractive satiny appearance, particularly adaptable where a decorative color might be needed and where corrosion resistance is not an important factor. It finds excellent use in splicing colored electrical cords which are exposed.

Acetate cloth tapes are made by Bauer & Black, Polyken Div.; Industrial Tape Corp.; and Minnesota Mining and Mfg. Co.

Acetate Film

Acetate film backings have three outstanding characteristics: high resistance to electrolytic corrosion at high humidities; exceptionally high dielectric strength; and extreme thinness. A 3.5-mil acetate tape has a dielectric strength of 5000 volts and an electrical resistance of 67,000 megohms at 96% relative humidity,

and tensile strength of such a tape is approximately 20 lb. per in. of width. Its elongation before breaking is only 10 percent.

The tape is an ideal product for use in very small units where dielectric strength in limited space is required.

Military specifications for electrical insulation, MIL-T-15126, Type AF, include acetate film tapes for extremely fine wire coil work, for splicing lead wires, as coil wraps and coil insulators in radio, TV, and relay coils, and in solenoids where high dielectric strength and good moisture-resistance is essential.

The moisture- and aging-resistance of acetate film backings coupled with special long-aging synthetic resin adhesives create a tape for permanent protection, sealing, and holding. One consumer application in which the aging-resistant properties of the transparent tape have found ideal use is in the mending of valuable documents and similar papers.

Manufacturers of acetate film tapes include: Minnesota Mining & Mfg. Co., Industrial Tape Corp., and Technical Tape Corp.

Writing Tapes

A special category into which the acetate film backings fit is in labeling tape, developed by Labelon Tape Co., Rochester, N. Y. The tape consists of a special carbon paper laminated between two sheets of acetate film. When a pencil or stylus is used for writing on the transparent acetate, the lettering is transferred by the sealed-in carbon paper and cannot smudge or smear off. The tape is also available with prepared copy already printed on the inside surface.

Acetate labeling tape is non-hydroscopic; will not yellow with age, dry out, or flake off; and has an excellent shelf life. It is used for labeling in stock rooms on laboratory bottles, in tool cribs, and for similar applications.

POLYESTER

Only three companies—Minnesota Mining & Mfg. Co., Industrial Tape Corp., and Technical Tape Corp.—are currently marketing adhesive tapes with a polyester film backing. But every company interviewed in the course of this survey is working hard to develop a tape to take ad-

★ ★ ★ PLASTICIZER NEWS ★ ★ ★

INCREASED AVAILABILITY

Widens Use Of Plastolein Plasticizers as Primary, Basic Types

The completion of Emery's revolutionary ozone-oxidation plant in several months will increase the availability and improve the economic position of Plastolein Plasticizers to the point where they can be used more widely as primary plasticizers.

This particularly applies to Plastolein 9720 Polymeric. Greater availability at present economic levels, together with its proven performance, make this product particularly appealing as a primary plasticizer. Not only does it have all the requisites of a basic plasticizer, but its permanence in terms of resistance to water and oil, and low volatility, is superior to most primary-type plasticizers. In addition, 9720 is extremely stable to both heat and light, does not deteriorate or cause brittleness upon aging, and has the efficiency common to most monomeric types.

Proven Performance

Plastolein 9058 DOZ (di-2-ethylhexyl azelate) also has the performance requirements of a primary plasticizer. Now, because of new processing methods, such as the ozone-oxidation process, the economic picture is improving rapidly. This, coupled with greater availability and proven performance of Plastolein 9058 will lead to its wide selection as a primary, basic plasticizer in the not too distant future.

Emery invites all manufacturers who are not already using a Plastolein Plasticizer, to start an evaluation of these two products immediately. Samples and descriptive literature are available on request.

Completion of Plant Building Marks First Major Step Toward Increased Production

The new building which will house Emery's revolutionary ozone-oxidation process has now been completed. Already it contains some of the unique equipment for this operation which is scheduled to go on line in several months.

Emery's New Ozone-Oxidation Plant

Production of Azelaic and Pelargonic Acids, from this plant, will result in increased quantities of those Plastolein Plasticizers which are based on these exclusive, unique saturated acids. Specifically, this involves Plastolein 9050 DHZ (di-2-ethylbutyl azelate), Plastolein 9058 DOZ (di-2-ethylhexyl azelate), Plastolein 9055 DGP (diethylene glycol dipelargonate), Plastolein 9715 and 9720 Polymerics.

The acids themselves are used also in the manufacture of alkyd resins, synthetic lubricants, nylon-type polyamides, soaps, and in the flotation of various minerals. The greater availability of these acids should open up many new avenues of research based on their unique properties.

Plastolein 9057 DIOZ Announced!

Di-iso-octyl azelate Now Available in Commercial Quantities

The addition of Plastolein 9057 DIOZ (di-iso-octyl azelate) to its general line of Monomeric and Resinous Plasticizers has just been announced by Emery.

Similar in performance to di-2-ethylhexyl azelate (Plastolein 9058) Plastolein 9057 is a primary, monomeric plasticizer for all types of vinyls, cellulosics and synthetic rubbers.

In addition to the efficiency, compatibility and permanence that make it a basic, primary plasticizer, Plastolein 9057 imparts excellent low temperature flexibility. It is applicable to vinyl calender sheeting, calender and cast film, calender and dispersion coated fabrics, extruded products and plastisol formulations. Plastolein 9057 also offers efficiency and low temperature properties for nitrile and GR-S rubbers and cellulosics.

MAIL COUPON TODAY for descriptive materials on Emery Plastolein Plasticizers!

EMERY INDUSTRIES, INC., Dept. F-5
Carew Tower, Cincinnati 2, Ohio
Please send me: ☐ Plastolein Plasticizer Booklet
☐ Plastolein 9057 Technical Bulletin

Name..... *Title*.....
Company.....
Address.....
City..... *Zone*..... *State*.....

Emery

Fatty Acids & Derivatives
Plastolein Plasticizers
Twitchell Oils, Emulsifiers

Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio
EXPORT: 5035 RCA Bldg., New York 20, New York
New York • Philadelphia • Lowell, Mass. • Chicago • San Francisco
Warehouse stocks also in St. Louis, Buffalo, Baltimore and Los Angeles

vantage of the electrical properties and strengths of the material.

Mylar, a product of E. I. Du Pont de Nemours Co., Inc., Wilmington, Del., is the polyester film that is used by both companies. Once the other companies in the industry have licked the problem of anchoring a pressure-sensitive adhesive mass to Mylar, polyester tape will probably be included in the line of every manufacturer.

The polyester film, available in gages as thin as ¼ mil and as thick as 3 mils, has superior electrical characteristics. A polyester tape only 2.5 mils in thickness has a dielectric strength as high as 5000 volts. Tensile strength of a tape of this thickness is 20 lb. per in. of width and it can be stretched up to 50% of its original length without breaking. Some polyester tapes have been developed that can stretch up to 120%.

The material has excellent resistance to acids, alkalies, acetones, ketones, hydrocarbons, and other common solvents. It has good shock resistance, will retain its flexibility at low temperatures, and has high dimensional stability despite heat and humidity changes to which it might be exposed.

The polyester tapes commercially available today are ideal insulating tapes in small constructions where space is an important factor and in any application where thick layers of insulation were previously required. They are also used for splicing, protecting, tube sealing, marking, covering, bundling, and for masking where strong cleaning solutions and solvents are likely to find frequent use.

OTHER TAPES

Saran is the only other plastic tape backing that has appeared in commercial form. A 2-mil transparent tape, developed by Minnesota Mining & Mfg. Co., has excellent conformability and is used where low caliper, high sheen, and low moisture-vapor transmission are required.

Still in the research stage, but coming on fast, are three other plastics materials—silicones, Kel-F, and Teflon.

In the modern era of jets operating at super temperatures and of continuous government and industrial activity in the Arctic regions, the ability of these three materials to maintain their properties at both exceedingly high and low temperatures has attracted the attention of the tape manufacturers.

Again, as with the polyesters, the problem that must be overcome is to permanently anchor the adhesive to the backing.

•

The pressure-sensitive tape industry is still a young one. The use of plastics as a backing material is even younger. If the creative development activities which characterize the tapes mean anything, both have a long way to go. In a continuing display of versatility, industrial and household users are constantly finding ingenious new applications to which the plastics tapes can advantageously be put.

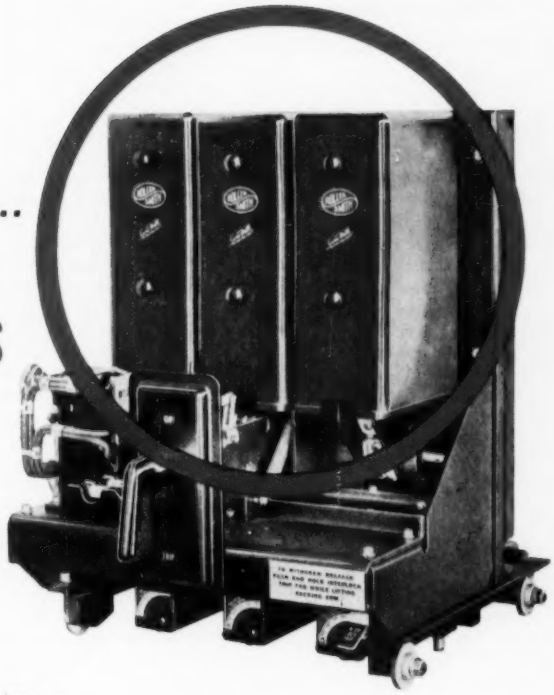
The future of tapes looks promising . . . and it looks toward plastics.

•

Next month: A second article will cover reinforced tapes, the different types of plastics coated tape, and applications for both.

When dependability is vital...

rely on shock-resistant G-E RUBBER-PHENOLICS



Covers for "Arc-Mill" circuit breakers are now molded of a shock-resistant G-E rubber-phenolic molding material for Roller-Smith Corporation, Bethlehem, Pa., by Northern Industrial Chemical Co., Boston, Mass.

The covers of the three "Arc-Mills" in this large air circuit breaker *must* be structurally reliable. A General Electric rubber-phenolic compound proves ideal for this type of application. Why?

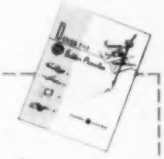
BECAUSE... it has the *heat resistance* needed to withstand hot gases created by arcing and has good *dielectric strength;*

BECAUSE... it has the *shock and fatigue resistance* required to withstand repeated impact from the breaker mechanism.

Substantial cost savings are also realized in this application where a G-E rubber-phenolic replaces fabricated phenolic laminates. Breakage in handling and shipping are minimized. And the covers are easy to mold despite the long, 11½" sections which would present difficulties with bulkier impact materials.

Why don't you try G-E rubber-phenolics?

Shock-resistant G-E rubber-phenolics offer you an excellent opportunity to use plastics for heavy-duty applications. They produce parts which resist breakage in assembly and service, accommodate large metal inserts without cracking, and permit lightweight designs without reinforcement. Keep G-E rubber-phenolics in mind for your next job. Your molder can tell you more about them, or send the coupon today for a free "Design File."



General Electric Company
Section 314-4A, Chemical Division
Pittsfield, Massachusetts

( ) Please send me a free copy of "Design File–G-E Rubber-Phenolics."

( ) I am particularly interested in G-E rubber-phenolics for_____

Name_____

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City_____ Zone____ State____

You can put your confidence in—

GENERAL ELECTRIC

Finer Future

(*Continued from pp. 80-82*)

a heavy dash of self-interest! With greater self-interest, Mr. Smith would have discussed the J.A. program with his employees who had volunteered to act as Advisers. He would make clear that he regarded their activity as part of the public-relations program of the company and that he, and the rest of the management, were grateful for the employees' interest in the company. He might, if he so desired, indicate that the management regarded J.A. as an informal training program for employees. He would give positive and unmistakable proof that he was anxious to help in any way he could.

Then, right after the J.A. company organized, the Advisers would urge the junior president to call on Mr. Smith and offer five shares of stock to the senior president as an investment. The 17-year old president does just that and tells the members of the company, and his parents, and his friends about it. He has met Mr. Smith and sold him five shares of stock!

So Mr. Smith and his company now mean more than they did before to the boy and to the boy's circle of friends and relatives. Chalk up another plus for the J.A. program—Mr. Junior President identifies himself more closely with adult business because he has talked on a man-to-man basis with the head of a big company.

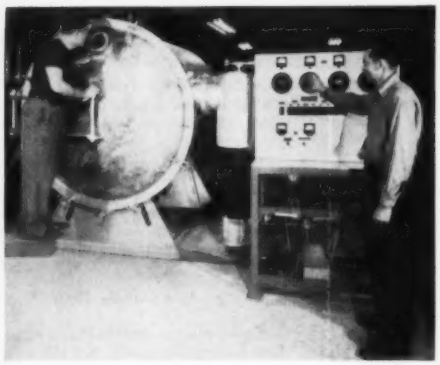
Later on, the J.A. company gets its charter. Mr. Smith pays a visit to the J.A. Business Center, meets and talks with the young business people, and presents them with their charter certificate. Pictures of the ceremony are taken for the Smith Co. house organ and the local papers. Another selfish plus is added for Mr. Smith, together with these plusses for J.A.: still more personal identification by the Achievers with business; publicity which interests more people in J.A.; publicity which gives a morale boost to Achievers and their families and their friends.

Then the J.A. company swings into production for the Christmas market. Orders begin to outstrip production capacity. "This," they think, "is easy."

But, after Christmas, sales slump; the Achievers have run out of market—the easy market of family and friends. Now they have to put on their selling clothes. At first it's discouraging. Their spirits slump with their sales charts. So the sales adviser gives them pointers, calls in his firm's sales manager for a short course in door-to-door selling. Perhaps Mr. Smith stops in to see how things are going. Maybe he even lets the junior sales manager try his new knowledge on him. He wouldn't be head of a thriving company if he didn't know how to let the teenagers sell him an item or two—and make them work to make the sale!

Is this another selfish gesture for Mr. Smith? Yes. Is it a help to the Achievers? You bet!

Three months later, Mr. Smith invites the members of the Junior Company to tour the Smith plant. The tour can be elaborate and end up with lunch or it can be simple and close with a round of "Cokes." Again it is shown that J.A. is a two-way street: Smith and his firm have added to their community relations; the Achievers have learned more about business and have intensified



their identification with the competitive enterprise system.

At the end of the J.A. year, in May, there comes the Future Unlimited Banquet at which recognition is given to Advisers and Achievers. Mr. Smith, who is looking forward to his stock liquidation payment with—he hopes—a dividend, is a guest at the J.A. company's table. Topics for conversation are unlimited, naturally, but they talk shop. The Achievers had their sales problems: so did he. Production was no problem; he has been wrestling with it for some time. The exchange is free and unstilted. Junior Achievement has bridged the gap so often filled with small talk.

Mr. Smith has been shrewd and calculating all year long. He and his company have played all the public-relations angles—and done it well. More power to him! His enlightened self-interest has helped Junior Achievement give more meaning to its members and that is the goal.

Before pointing out specifically how the plastics industry can help promote Junior Achievement, let's look at the background.

Junior Achievement started in 1919 when Horace A. Moses, then president of the Strathmore Paper Co., initiated the movement. Emphasis was primarily on hobby aspects of small scale manufacturing. J.A. grew slowly, spread into New England and New York City. It was not until 1946 that Junior Achievement began to push national expansion with business experience as the basic consideration. At that time it was operating in 14 industrial areas in 12 states. Today there are some 1500 J.A. companies running in 67 communities from Spokane to Boston, from Minneapolis to Houston.

What Can be Done

Where there are fifteen hundred companies this year, there should be two thousand next year. And every member of the plastics industry can help make this possible.

First, plastics companies should sponsor as many J.A. companies as possible—and make this sponsorship 100% effective by adding a heavy dash of selfishness to the altruistic desire to help the youngsters learn about business.

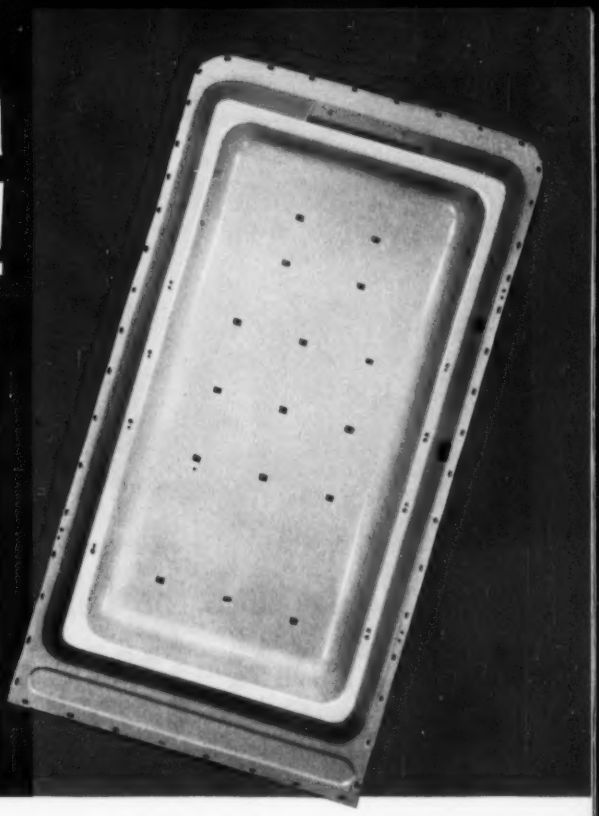
Secondly, plastics companies can help provide the necessary financial support that J.A. must have if it is to grow. Junior Achievement can start new programs and increase the scope of its present programs only as it can train additional manpower and make necessary expenditures.

Finally, plastics companies can take an active and personal interest in J.A. They can support the Junior Achievement committee of the S.P.I. and explore ways in which the activity can be even more fruitful. They can—and should—talk to business friends about it, bringing more of them into the J.A. picture to help it start in new cities and towns so that more youngsters in more communities can, from experience, learn the fundamental economics that have made our country great.

Anyone not already active in J.A., can get specific details from Langdon Williams at the S.P.I., 67 West 44 St., New York 36, N.Y., or from the writer at Junior Achievement, Inc., 345 Madison Ave., New York 17, New York.

Every effort made to help more youngsters prepare themselves for the future will help the plastics industry at the same time.—End.

Largest area ever molded!



General American's 1800 square inch inner door panel for the new 1953 WESTINGHOUSE 12FT. REFRIGERATOR

SIZE: Approximately 1800 sq. inches (59¼" h. x 32" w.)
MATERIAL: High-impact polystyrene
MOLDING: performed on one of General American's battery of 300-oz. injection presses

NEW SALES FEATURES:

Unexcelled luster and appearance
Very easy to clean
Does not absorb odors
Color all the way through
Chip and crack resistant
Permits deeper shelves
Increases cubic content
Strong and dimensionally stable

Member, Committee on Large Plastics Molding

Not very long ago, engineers would have said, "You can't do it! Too big! Too difficult!" But as in so many cases with plastics, none of the objections held up. Good creative engineering, thorough understanding of materials and large production equipment enabled General American and Westinghouse engineers to do the job.

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Memory for Plastics

(*Continued from p. 83*)

ode ray tubes, and has 13 miles of wire circuitry and cable. It has successfully landed over 3 million aircraft in adverse weather conditions, all over the world.

As explained by Paul Paddock, Supervisor of the Product Design Group of Gilfillan, "the ring itself must 'pipe' light through its calibrations. A uniform index of refraction is therefore of essential importance. The item must also allow for the differential in thermal expansion between the aluminum and plastic component parts under a temperature range from −18 to +71° C.; consequently, dimensional stability is a vital factor for operational purposes."

A portion of the specifications for this component reads: "Part must be stabilized so that it will return to the dimensions and tolerances shown upon cooling to +70° F., ±5° F., after having been subjected for two hours to +170° F., ±5° F." Dimensions in the specifications are set at ±0.002 inches. Inspection is 100 percent.

The ring as produced by Perma Plastics, is made from aircraft quality cast Lucite or Plexiglas acrylic sheet. Perma Plastics treats these materials with its "stabilizing process" and then fabricates as per print. After softening the treated ring with an application of heat, it is possible to demonstrate the new memory by tying it into a knot and allowing it to cool in that form. Then, upon reheating, the ring returns to its exact dimensions and fabricated form, with a uniform refractive index of 1.4876, ±0.0002. A stabilized acrylic disk which covers the cathode ray tube in the assembly, given the same treatment, responds similarly.

After treatment the ring is calibrated, radium filled, first surface aluminized, and finally coated with flat black lacquer.

In Acrylic Lenses

Chester Cnalberg, Santa Monica, Calif., an independent plastic lens authority and manufacturer of optically perfect steel lens cavities, states that, in tests made on an acrylic lens stabilized by Perma Plastics, he "heated the lens to 250° F. for 30 minutes, folded it, then

clamped it in a vise until cold. It was returned to the oven for 30 minutes at 275° F., after which it was found to have resumed its original state, with focal length the same as before. Upon projecting through it, no change in the molecular structure could be noted.

"These severe tests appear to have had no effect upon the lens. Even the impressions made by the vise disappeared and no visual sign of strain could be detected when projecting through a vertical and horizontal lined film."

According to a report from Rohm & Haas Co., three different pieces of Plexiglas I-A delivered to Perma Plastics had refractive indices of 1.4890, 1.4888, and 1.4900. The same material in the form of disks was stabilized by Perma and a subsequent Rohm & Haas test report showed refractive indices of 1.48768, 1.48755, and 1.48788 respectively.

Test reports from the Chaney Laboratory, Glendale, Calif., show that one type of Lucite sheet so treated will have a uniform refractive index of 1.4958, ±0.0002.

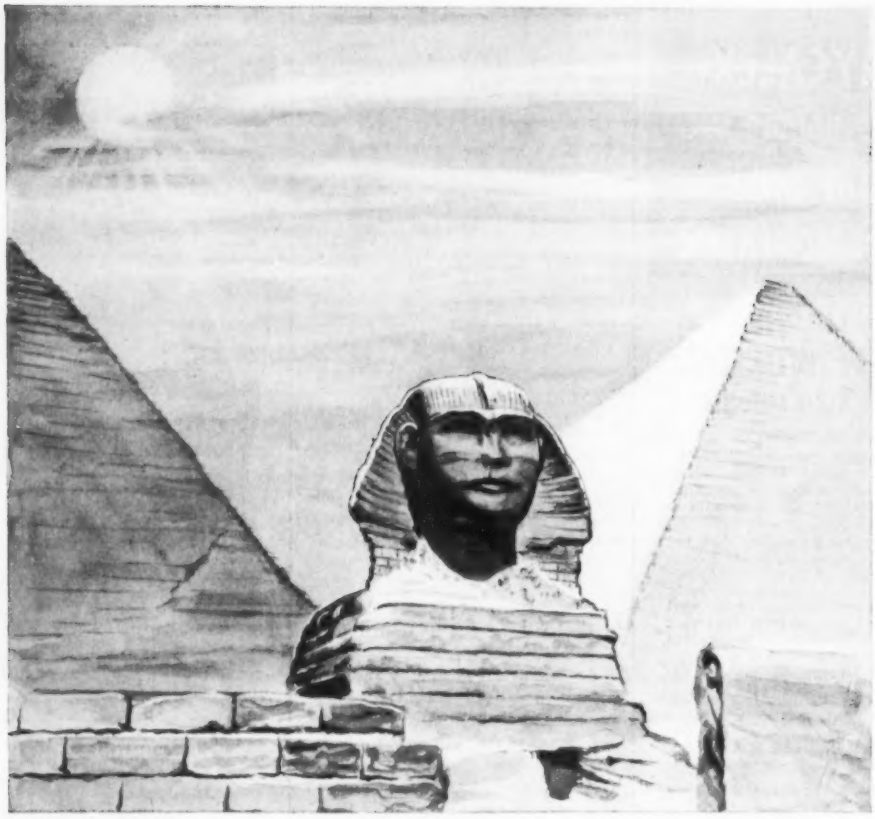
Any material having a uniform refractive index will also possess constant dielectric strength. Using the standard ASTM method, dielectric strength of these stabilized materials shows no variation from point to point and piece to piece.

For Electroforming

An outstanding example of thermoplastic materials as applied to the electroforming industry, is in the use of stabilized styrene mandrels to electroform complicated radar waveguide components; the styrene is then dissolved out, leaving an optical surface and a dimensionally accurate interior.

Bone Engineering Corp., Glendale, Calif., one of the largest electroforming concerns on the West Coast, has, in conjunction with Perma Plastics, utilized this application which has proved to be a most practical and economical method of mass producing these precision parts. It has also found the use of stabilized acrylic to be ideally suited as a matrix for electroforming dies to reproduce plastics lenses in quantity.

How is such stabilization accomplished? Perma Plastics will not say. All it will do is unconditionally guarantee to support its claims in practice.—END.



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Monofilaments

(*Continued from pp. 119-136*)

two variables, as shown by birefringence and retraction studies, are critically dependent on fabricating variables.

Physical properties could be plotted in terms of birefringence or percent hot stretch. Similar conclusions can be obtained irrespective of the method of plotting. It is felt that birefringence is a more fundamental measure of orientation than percent hot stretch, therefore the data presented here are all plotted in terms of birefringence.

Figure 26 represents the same data as used in Fig. 25, plotted in terms of percent hot stretch. The advantage of plotting the data in terms of percent of hot stretch is that it becomes more evident that higher percent stretch must be used to attain optimum properties for higher stretching bath temperature.

The optimum tensile strength obtained for oriented polystyrene was 20,000 p.s.i. This value appeared to be close to the maximum value. Monofilaments stretched to obtain values beyond this point usually broke during fabrication. Optimum tensile strength was not attained at 260° F. stretching bath temperature because of the mechanical limitations of the unit. The maximum amount of hot stretch that could be given a filament in the described orientation unit was 1500 percent.

Elongation—Unlike tensile strength curves, elongation increases in value as the orientation increases to a certain point, and then decreases (Fig. 27). The curves are similar to tensile strength curves in that at higher stretching bath temperatures increased elongation is obtained at the expense of less orientation. The maximum value of elongation obtained

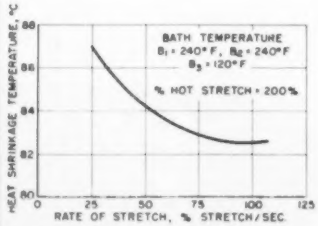

Fig. 33—Stretch rate versus temperature

is between 40 and 90% irrespective of fabricating conditions.

Knot Strength—This property is similar to most physical properties in that it is a function of orientation as well as stretching bath temperature (Fig. 28). Unlike tensile strength, it decreases at certain values of orientation. Over-stretching the polystyrene monofilament can result in very low knot strength.

Stiffness—Similar to other physical properties, stiffness is a function of orientation as well as bath temperature (Fig. 29).

Flexure—Unlike other physical properties, flexure is a function of the degree of orientation but is not a function of the stretching bath temperature (Fig. 30). Increased orientation results in a greater abil-

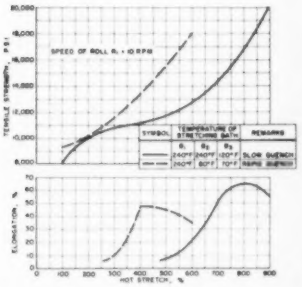

Fig. 34—Tensile strength and elongation as functions of quenching temperatures

ity of the monofilament to withstand repeated flexes. This is true until a certain value of orientation is reached, at which point the ability to withstand repeated flexes decreases slightly.

Heat shrinkage temperature—The rate of decrease in shrinkage is not a linear function of orientation (Fig. 31). As orientation decreases towards zero the slope of the curve increases rapidly. This is consistent with the theoretical picture of the mechanism of orientation. At zero orientation, monofilaments should not exhibit any shrinkage. The heat shrinkage temperature should therefore be infinite. This accounts for the rapid increase of the slope of the curve as the orientation approaches zero.

Effect of Rate of Stretch

Figure 32 shows that increased rate of stretch improves tensile and

elongation properties. Similar results can be shown for knot strength, flexure, and stiffness. Optimum physical properties obtained at any rate of stretch are similar.

Heat shrinkage temperature decreases as rate of stretch increases (Fig. 33). This is consistent with the theory that for a greater rate of stretch, more of the shorter time portion of the retardation spectrum is oriented. Heat stability of the oriented filament is lowered accordingly.

Effect of Rate of Quench

Birefringence study indicated that higher orientation is obtained at lower percent hot stretch when quenching rate is increased. Since

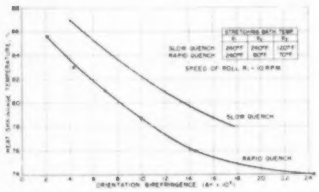

Fig. 35—Effect of quenching rate on heat shrinkage temperature

physical properties are a function of orientation, one would expect similar results. Figure 34 shows that this is true for tensile strength and percent elongation. However, the optimum physical properties are the same irrespective of quenching rate used.

Heat shrinkage temperature is lower for the greater quenching rate (Fig. 35). The result is consistent with theory in that higher quenching rate prevents more of the shorter retardation time portion of the spectrum from becoming disoriented. Secondly, at the higher quenching rate greater thermal strains are induced in the extruded monofilaments. These are important considerations when one wishes to evaluate the heat stability of the filament.

Effect of Molecular Weight

Table III* lists the optimum physical properties of oriented polystyrene for different molecular weights. Aside from the very low molecular weight polymer, optimum physical properties for different molecular

* Table III appears on p. 152.

weights are similar. The principal advantage of using higher molecular weight polymer is that one can fabricate over a wider range of conditions. Low molecular weight polymer has a tendency to break at low rates and percent stretch. It is important from a fabricator's viewpoint to use high stretch rates and percent stretch. High molecular weight polymer makes this possible.

Annealing of Monofilaments

Annealing of polystyrene monofilaments serves three purposes. First, it straightens the monofilament and secondly, it produces a clear bristle. Before annealing, the monofilament is usually curved and sometimes has a milky appearance. The third purpose of annealing is to improve heat stability.

In this investigation the monofilaments were wound under slight tension on a flat reel. The monofilaments were then annealed by placing the reel in a constant temperature bath for a known length of time. When annealing polystyrene monofilaments it is important that the monofilament be held under slight tension. Placing restraint on the monofilament prevents disorientation by shrinkage.

Table IV* lists the physical properties of polystyrene monofilaments subjected to a minimum annealing technique. Minimum annealing is defined as the least time at any one temperature that produces a clear straight monofilament. Note from Table IV that physical properties are unaffected by annealing. Variations observed are normal experimental fluctuations.

Heat shrinkage temperature improves upon annealing. The heat shrinkage temperature appears to be a function of annealing time and temperature. Similar results are observed when one anneals injection molded polystyrene (6).

It is significant to note from Table IV that the configurational strain or molecular orientation which is measured by birefringence is unaffected by annealing. Annealing apparently enables the molecules to assume more stable positions, thus relieving thermal strains. Highly oriented strands, before annealing, have a milky appearance. This milky appearance is probably due to mechanical imperfections which become visible only when severe stresses are

* Table IV appears on p. 132.

put on the fiber. Upon annealing the filaments, the polymer chains assume a more stable position, allowing the monofilaments to become clear and straight. Relieving these fabrication or thermal strains results in a higher heat shrinkage temperature value.

Recommended Fabricating Conditions

Physical properties are a complex function of orientation and the portion of the retardation time spectrum oriented. These two factors are functions of the fabricating variables: percent hot stretch, temperature of stretching bath, rate of stretch, and rate of quench. The fabrication variables chosen depend largely on optimum physical properties desired and mechanical limitations of the equipment. Generally speaking, the following procedures result in the production of good polystyrene monofilaments:

1) Stretch at high temperature (250 to 270° F.). Limiting factors for the elevated temperature are the ease of handling the extruded plastic and proper choice of stretching bath liquid.

2) Stretch to some value slightly below the maximum percent hot stretch. This enables one to obtain monofilaments of optimum physical properties. Stretching excessively results in fiber having a milky appearance and very low knot strength.

3) Stretch at high rate. The principal advantages are that optimum physical properties are obtained with greater output per unit time.

4) Quench at a moderate rate. Quenching too rapidly prevents the short relaxation time chains from becoming disoriented and induces thermal strains in the extruded plastic. These two factors lower heat stability. Quenching at moderate rate partially anneals the sample.

5) Anneal the monofilaments. This improves heat stability and straightens the fibers with no loss in physical properties.

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Butyrate Pipe Burrows Ahead

WHENEVER a plastic end product of great potential volume looms on the horizon, it is almost always beset with all manner of criticism, complaint, doubt, and competitive carping by congenital crepe hangers, just plain sour pusses, and those whose business will be hurt if the new product becomes successful.

Then, of course, there are always the intelligent, straightforward critics who give constructive criticism in order to point out problems that must be overcome if the new product is to survive. Unfortunately, such constructive criticism all too frequently gets jumbled up with the "hanky-panky" put out by the crying societies named in the first paragraph and is often turned to the disadvantage rather than advantage of the new industry.

All the critics nearly always forget that almost any new product of potentially big volume must go through a long period of growing pains while problems of fabrication and adjustments-in-use are made. The plastics industry is full of such examples. Washing machine agitators, radio cabinets, polystyrene housewares, vinyl floor covering, garden hose, and wire covering are just a few. Plastic pipe is now right in the middle of such a controversial melee.

A little over a year ago this writer ventured the guess that plastic pipe would become one of the plastics industry's five largest-volume products within anywhere from 5 to 8 years. It will by no means take over the entire pipe market, for plastics always have certain limitations just as metal has corrosion and weight limitations. Nevertheless, we still think our big volume prediction was a good guess.

Recently we were disturbed by too frequently broadcast innuendoes that plastic pipe was not getting anywhere. To get to the root of the matter in at least one branch of the plastics pipe industry, we went to one of the horses' mouths—this horse being Tennessee-Eastman Co., the producer of cellulose acetate butyrate. Butyrate has been showing a steady increase of volume in the pipe field and executives of the company have never been noted for making extravagant claims for their products. They have always been considered extremely conservative when making predictions. In fact, cellulose acetate butyrate was on the market for several years before it was even advertised. It is, therefore, with a feeling of assurance that we print the following material, gleaned from that company's report on the progress of extruded butyrate pipe.

Pipe for Utilities—Southern California Gas Co. has used cellulose acetate butyrate (Tenite II) pipe since 1945 when 1700 new services were installed. Over 136,000 new services and 277,000 service replacements had been installed by the end of 1951. Over 100,000 lineal ft. have been in service over 5 years. Practically all this pipe is still in service and sampling inspections have revealed no defects or weaknesses which would indicate that it is unsatisfactory. From 8 years of observation, it is considered likely that butyrate will last at least as long as steel. There have been a few breaks, but even those few were mostly due to accidents. Of course, the pipe has certain limitations and is not used where ground temperature goes over 150° F. or where sustained pressure is over 100 pounds. It is not recommended for use in rocky soil nor is it used above ground or for the transmission of artificial coal gas—only natural gas is piped in lead-in lines from mains to houses.

An important installation angle is that flexible butyrate pipe can be inserted in old service pipe, which acts as a casing. This saves labor in digging up the old line and makes fewer excavations necessary.

In cost comparisons, it has been demonstrated that 81 cents worth of ½-in. butyrate pipe will do the same job as 88 cents worth of copper pipe or $1.00 worth of ¾-in. steel pipe in replacement operations. For installation of new services the cost of butyrate compared to steel is about even.

Another installation of some 28,000 ft. was made by the Public Service Co. of Colorado in 1951. Tests indicated that satisfactory methods had been found for controlling expansion caused by changes of temperature and for sealing joints; that no extensive training programs for installers were involved; that capacity of flow was increased 18.5% over steel pipe because of greater I.D. and less friction of the butyrate pipe.

Following the experience of the two companies already mentioned, more than a score of Midwestern utility companies are now either using or testing butyrate pipe for gas service lines. It is of such interest to the gas industry generally that a complete session of an American Gas Association meeting was devoted to the subject of plastic pipe.

Further interest by utility companies in butyrate pipe includes its use as water mains and power line conduits. One water main 4 in. in diameter and extending for almost a mile is under trial; several installations of power line conduits have been made on a testing scale. Utility officials are interested because it is easy to lay and apparently stands up under heavy abuse. One installation is reported where two men laid 247 ft. in 20 min. as compared to the normal four hr. required in laying conventional conduit.

Pipe for Oil Fields—Hundreds of miles of butyrate pipe are now used in oil fields for conducting crude oil and salt water. One installation at least 6 miles in length has been used satisfactorily for this purpose for more than a year.

The great advantage of butyrate over metal is corrosion resistance to sour crude oil, salt, and electrolytic action of the soil; but it is also $\frac{1}{12}$th the weight of the cement-lined steel pipe commonly used for the same purposes. It is also convenient to install. Slip-sleeve couplings are usually employed, but if threaded couplings are used the plastic pipe can be threaded by the

* Reg. U. S. Pat. Off.

SAFETY *by Swedlow* in the Chase C-123

Designed by the Chase Aircraft Co. of Trenton, New Jersey and now being built in the Kaiser-Frazer Willow Run plant, this huge twin-engine troop and cargo-carrying transport emphasizes safe and speedy delivery of personnel and supplies for the USAF.

An important safety factor in this transport is the use of SWEDLOW molded fiberglas fuel cell backing for the "Power Packages" supplied by Rohr Aircraft Co. of San Diego, world's largest producers of power packages for the aircraft industry.

For information on other recent developments and applications of SWEDLOW molded fiberglas or transparent glazing materials, contact the SWEDLOW plant nearest to you.

Swedlow PLASTICS CO.

LOS ANGELES, CALIFORNIA • YOUNGSTOWN, OHIO

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same tools used for metal pipe. It can also be cut with a carpenter's hand saw. One man can lift and carry a bundle of three 20-ft. lengths which weigh 60 lb. in comparison to 720 lb. for the same amount of cement-lined steel pipe. In a typical installation three men laid 4000 ft. of 4-in. butyrate pipe in a day. It usually requires eight men to lay the same amount of steel pipe. The plastic pipe does not clog with paraffin on high-paraffin oil lines. It has an estimated bursting pressure at 77° F. of from 360 to 700 lb., depending upon size. Safe working pressure is from 72 to 140 pounds. A dozen or so extruders are now advertising butyrate pipe with the necessary fittings for use in oil fields. Most of them report a growing business.

Butyrate Pipe in Australia—Around 5 million ft. of butyrate pipe is used in carrying water to Australia's drought-ridden areas. It has superseded metal lines which often have to be replaced every 12 months because of corrosive soil. In many regions the plastic pipe is laid without trenching; one end of a length of pipe is attached to the shaft of a mole plow set for the desired depth and the pipe is thus laid and covered in one operation. One citrus orchard alone uses 250,000 feet. Tee-offs for irrigation spray systems can be easily fastened to the pipe.

Butyrate pipe is also used in Australia for conducting fruit juice in bottling works; for skimmed milk in dairies; and for aerating plating baths. The lines can be cleaned with hot water at a temperature of about 150° F. The pipe is also in use for conducting water from mains to houses in Australian cities.

These are samples of what is happening to the butyrate pipe industry today. They could be multiplied by many other examples. Anybody want to bet that volume will decline?

Vinyl Pipe With Fittings

ANNOUNCEMENT of availability of a new rigid vinyl plastic pipe which can handle corrosive chemicals at 500 p.s.i. working pressure (77° F.) is made by Kraloy Plastic Pipe Co., Inc., 4710 E. Washington Blvd., Los Angeles 22, Calif. Designated as Kraloy D-500, the pipe is available in sizes from ½ to 4 in. with all necessary molded fittings.

The company claims that the product is made from an exclusive formulation and has many advantages over other types of plastic pipe as well as metal pipe. It is used for the transmission of practically all chemicals, including oxidizing agents, at temperatures up to 190° F., and will not support combustion. It can be used above ground, exposed to sunlight and weather conditions, as ultra-violet rays have no effect upon it.

Kraloy D-500 pipe and fittings are distributed by National Supply Co., HOMCO, Howard Supply Co., and Crane Co.

Water Pipe

TWO plastic pipes in one, named Twinduit, is a new product designed by Yardley Plastics Co., 142 Parsons Ave., Columbus, Ohio, exclusively for jet pump installations. Twinduit simplifiies the dealer's stocking problems. Instead of having to stock two or more sizes of plastic pipe for jet well jobs, he can get the necessary Twinduit piping in one coil.

The product consists of two pipes, extruded and simultaneously joined in perfect alignment with a thin web of the same plastic material. It comes in three sizes: 1 by 1¼ in., 1¼ by 1¼ in., and 1¼ by 1½ inches. Yardley also produces a complete line of fittings.

Style and Fashion in Pipe

HIGH-IMPACT styrene pipe in 10 or 20 ft. lengths and sizes ranging from ½ to 6 in. O.D. is now available from The Atlas Mineral Products Co., Mertztown, Pa., and Houston, Texas. Threaded fittings in sizes up to 2 in. are also available. This product, called Ampcolite, is one of the latest additions to the Atlas line of plastic pipe.

Another Atlas development is their new Plastaloy-armored Ampcolite pipe. This pipe is made of a combination of thermosetting and thermoplastic materials to provide a unit which is satisfactory for most corrosive solutions at temperatures up to 195° F. The unarmored Ampcolite pipe has good impact resistance, but the Plastaloy reinforcing armor improves the impact considerably. It is available in sizes up to 6 in. O.D. The armoring can be done by the manufacturer or the pipes may be armored after they have been installed.

These new style pipes have been added to the company's line of rigid polyvinyl chloride Ampcoflex material which is recommended for pipe and ducting where high impact, chemically resistant material is needed for piping where corrosive liquids or gases are prevalent. This material may be hot welded with joints as strong as the sheet itself. Even the bolts, nuts, flanges, valves, and other materials used with it are furnished completely corrosion-proof.

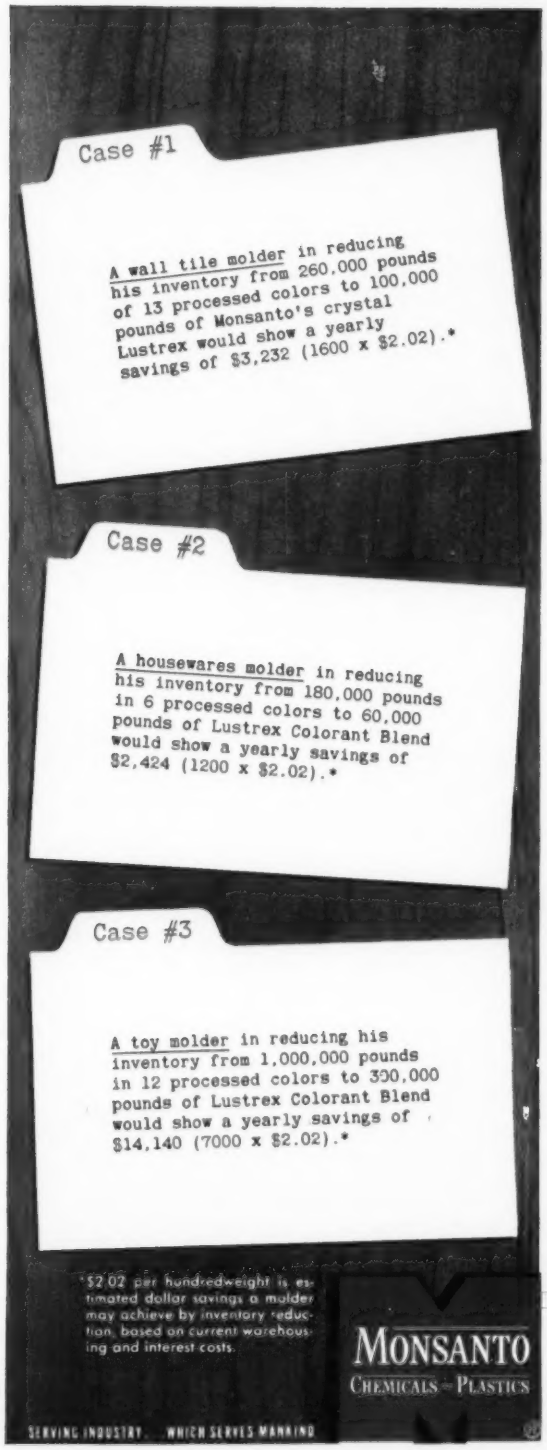
The company will furnish bulletins with complete information upon request to The Atlas Mineral Products Co., 92 Ash St., Mertztown, Pa.

Screen Cloth

WHAT'S happening to saran screen cloth? There have been rumors that it was on the decline but investigation indicates that such rumors are unfounded. Saran screen seems to be in a very healthy condition. At least the producers report good health: one has grown steadily for 5 years, another reports that business is flourishing.

The unfavorable rumors stem from a number of sources. One, of course, is from competitors with other materials. That is just plain habit and can be disregarded.

A second source finds a base in historical statistics. The screen cloth industry had its biggest volume year in 1947. Without even including saran, the market is reported to have absorbed over 600 million sq. ft. that year. The biggest year ever before was 500 million. It seems that people went crazy over screening of all kinds in 1947 and early 1948. Then they suddenly quit buying in late 1948 and every type of screen cloth on the market suffered a severe decline. Saran suffered along with the rest, but many who noted that suffering disregarded the corresponding fall in all types of screening. They mistakenly wrote off saran screening as a dead or dying duck. But saran



Big inventory savings

Many save over $2,000 a year dry coloring LUSTREX Colorant Blend Styrene

Stockpiling a half a dozen or a dozen shades of styrene is expensive business, considering warehousing costs and interest charges on capital invested in material.

That's one big reason so many leading molders have switched to dry coloring their own Lustrex Colorant Blend *crystal* styrene. They've discovered that by dry coloring you can reduce your inventory by as much as 75% . . . yet have any shade of styrene you want on a few minutes' notice.

The molder who can cut back his styrene inventory 100,000 pounds a year can save well over $2,000 (based on conservative estimates of current warehousing and interest costs). On larger operations, the savings easily swell into five figures.

More than this, dry coloring Lustrex Colorant Blend frees your capital for other jobs . . . increases the flexibility of your operation . . . reduces worry over materials shortages and/or delays . . . and eliminates the problem of disposing of stock in unwanted or obsolete colors.

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MONSANTO CHEMICAL COMPANY, Plastics Division, Room 2629, Springfield 2, Mass.

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screening is a lively duck today. Volume has been steadily mounting ever since 1949, according to screen cloth producers, and is gradually cutting into premium metal screen volume.

Other adverse rumors about saran were based on the complaint that saran screen would shrink and break or warp the frame. Unfortunately that has happened, but as a rule only with combination screen and storm windows when the saran screen was stored between two sheets of glass where the temperature will sometimes rise as high as 200° F. Under such heat, the oriented, stretched saran monofilament would seek its normal (and shorter) length and exert sufficient strain to sometimes warp or come free from the frame. It was a rough experience while it lasted but has been corrected. Producers of screen cloth soon spotted the trouble and now refuse to sell to combination window manufacturers unless the saran screen is stored in front of the glass where it is not subjected to such high temperature.

Millions of yards—The amount of saran screen cloth produced in 1952 for civilian use is known probably only by Firestone Plastics Co. and National Products Co. which are extruders of yarn made from saran and they are mum on the subject.

One estimator said the figure might be anywhere from 75 to 100 million sq. ft., with emphasis on the latter figure. With 18 by 14 mesh filament of 0.015-in. diameter using about 1 lb. of saran to 19 sq. ft. of screen, that would mean somewhere near 5 million lb. of saran resin.

Saran screen sells at retail at about 13¢ a sq. foot. Aluminum is about 15¢, and bronze is several cents more.

The military organizations are also heavy users of saran screen. The Quartermaster Corps awarded contracts for a little over one million sq. yd. in February 1953 and expected to receive bids for 843,000 sq. yd. more in March. For the fiscal year ending June 30, 1952, they bought over 2 million sq. yards. The Army's saran screen is 20 by 20 mesh, made of filaments 0.012-in. in diameter, and runs about 25 sq. ft. to the pound. The above mentioned screening is bought by the Quartermaster Corps and provided to tent makers for use in tents. The U. S. Engineer Corps and the Surgeon General's Dept. do not buy it for use in cantonments or hospitals, supposedly because of that incomprehensible complaint about soldiers burning it with cigarettes.

Plastic screen cloth producers are also experimenting with vinyl coated glass material. There are two varieties—glass filament coated with vinyl and glass fabric marquisette coated with vinyl. The complaint about the latter is that the glass is not fully coated where the glass strands overlap; on the other hand, it might be less costly than the vinyl coated glass yarn which would theoretically sell in about the price range of bronze screen. Critics assert that the art of coating on glass yarn has not yet been completely perfected insofar as evenness of coating is concerned.

French Plastics Show

WORLD-WIDE interest is being attracted by the French plastics exhibit scheduled to be held in Paris from June 18 to 29, 1953.

Known as "The Big Week of Plastics," the exposition will consist of displays by manufacturers, converters, and end users. In addition to showings of French machinery, materials, and plastics products, there will be an exhibition of the products of a number of American companies.

The exhibit will be held at Parc des Expositions, Porte de Versailles, Paris. Full information can be obtained from Commissariat Général du Salon de la Chimie, 28, rue St.-Dominique, Paris 7°, or from the editor of Industrie des Plastiques Modernes, 40 rue du Colisee, Paris 8°, France.

Inert Filter

FILTER elements made from porous Kel-F have been announced by Porous Plastic Filter Co., 30 Sea Cliff Ave., Glen Cove, N. Y., one of The Pall Filtration Companies. The advantages of porous Kel-F are its complete resistance to practically all chemicals and the fact that it can be used at temperatures up to 300° F.

The material is presently available in disks up to 12 in. in diameter and in thicknesses of 1/16 and 1/8 in., with solid Kel-F edges.

Complete fabricated filters utilizing porous Kel-F filter elements are now reaching final developmental stages and will be announced when available.

Rare Chemicals Supply

A LIST of unusual and rare chemicals that can be obtained in sufficient amount to be used in laboratory or pilot plant has been completed by Chemicals Procurement Co., 550 Fifth Ave., New York 36, N. Y.

The company serves as a clearing house between user and producer of scarce and lesser known chemicals and has prepared this list to give an indication of the chemicals which it can provide. The method of operation is to persuade research and development directors to come to the company when they need help in tracking down unusual chemicals and let Chemicals Procurement search the field to supply those needs. By taking advantage of this rare-chemical clearing house idea, scores of purchasing agents have saved many hours of time, and research technicians have been able to speed up their development work to a considerable degree by filling their needs without delay. According to S. J. Canter, director of the organization, many of even the largest chemical companies have used his company's services to obtain experimental lots of new and unusual materials for laboratory and pilot plant use.

Foundry Resin

IN order to avoid any possible confusion of trade names, Monsanto Chemical Co. announces that Lustrex 886 has been renamed Lytron 886. The material, which eliminates clay balls from foundry sand, also improves packing characteristics of foundry sands and makes possible the production of truer, cleaner, and more economical castings.

Chlorosulfonated Polyethylene

MANY requests have come to this magazine about Hypalon, a chlorosulfonated polyethylene elastomer produced by Du Pont. Several times it has been announced in these pages

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that this material is not customarily classified as a plastic but belongs to the synthetic rubber family. From descriptive material that has crossed our desk, it would seem to be a material that competes in many cases with Neoprene, another Du Pont synthetic rubber.

Hypalon has been recommended particularly for chemical resistance and for blending with other elastomers for building up chemical resistance. In one example, Hypalon and a blend of the same material with hard rubber were the only materials that did not disintegrate upon exposure to 50% chromic acid at 200° F.

Laminated Emulsion Rolls

LAMINATED emulsion rolls which will resist highly acidic nylon sizing solutions have been announced by Synthane Corp., Oaks, Pa. For many years, these sizing rolls have presented a problem to textile processors because the high acidity of the sizing materials produced a corrosive action on aluminum emulsion rolls which resulted in discoloration of the nylon yarn.

Synthane, which had already produced laminated piping and fittings capable of handling nylon size as well as several other items for the textile industry, finally solved the problem through the use of its grade XX, a paper base material which machines to a smooth surface. Outer shells 3 in. long were fabricated from 3-in O.D. XX grade tubing. This became the contact surface of the roller over which the delicate nylon thread passes and which must constantly revolve in a shallow bath of the strong sizing solution. The ¾-in. I.D. hubs, press-fitted and cemented with a non-corrosive adhesive, were fabricated from grade C, a fabric-base material possessing high mechanical strength.

Fire Retardant Laminate

ELECTRONIC equipment can now be given additional protection against fire through use of a new fire retardant laminated plastics insulation which is self-extinguishing in one minute or less. Produced by General Electric Co.'s Chemical Div., Pittsfield, Mass., the grade is designated G-E 11542 Textolite laminate.

The paper base material was developed specifically for television, radio, and other electronic components where fire hazards exist and where the mechanical and insulating properties of laminates are needed. It has a low one megacycle power factor and is said to compare with more expensive glass cloth base materials in fire retardant qualities. It also maintains its self-extinguishing characteristics after three months' aging at 130° C.

The new grade has low moisture absorption and excellent electrical properties, including high insulation resistance under humid conditions. Sheets up to ⅛ in. thick have good punching qualities.

G-E 11542 Textolite laminate is available in natural light tan color in thicknesses ranging from 0.015 to 0.25 inches.

Floor Covering Kit

DISTRIBUTION of a lay-it-yourself kit, adhesive, and brochure to flooring dealers for the self-installation market is being made by Goodyear Tire & Rubber Co., Inc., Akron, Ohio. The Goodyear Flor-Master Kit and Goodyear Flooring Adhesive No. 60A are designed and recommended for proper installation of the company's flooring.

The kit contains a trowel and knife as well as the required chalk, chalk line, and instructions. The brochure gives step-by-step instructions for the use of the tools in preparation and application of the vinyl, making possible a simple yet professional-like job by home owners.

Summer Laboratory Courses

TO meet the growing demand by industrial scientists for advanced instruction in the use of physical tools in chemistry and physics, Polytechnic Institute of Brooklyn presents each summer a series of intensive courses for mature scientists.

This year one of the courses of particular interest to the plastics industry will cover progress in polymerization and copolymerization techniques. It will run from August 3 to August 7. Inquiries for enrollment should be addressed to Prof. I. Fankuchen, Polytechnic Institute of Brooklyn, 85 Livingston St., Brooklyn 1, N. Y.

More Acrylic Monomers

PRODUCTION of acrylic monomers by a new process in a new $8 million addition to the company's petrochemical operations at Deer Park, Texas, has been announced by Rohm & Haas Co., Philadelphia, Pa. The new process will employ acetylene, carbon monoxide, and various alcohols.

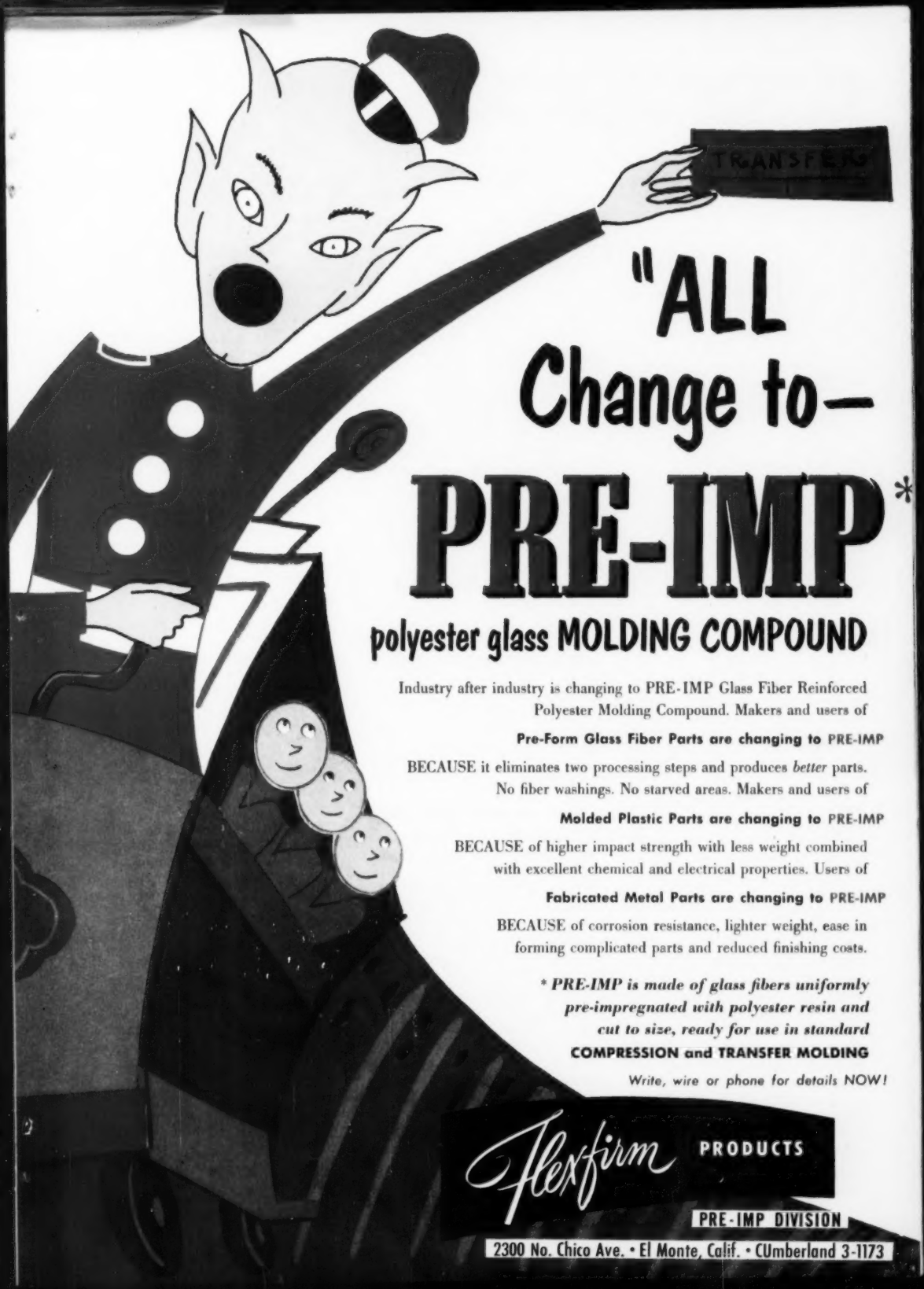
This is the second $8 million installation at Deer Park for the production of acrylic monomers. Two years ago, the company completed a plant there for the manufacture of hydrogen cyanide, another important raw material for acrylics. Dr. D. S. Frederick, vice president, states that it is the company's determination to maintain leadership in the field of acrylic production by manufacturing them from basic raw materials rather than purchased intermediates.

In addition to its use in plastics, acrylic monomers are constantly finding their way into more and more end products, such as leather finishes, textile finishes, textile fibers, lubricating oil additives, and soil conditioners. Among the newest is a 100% acrylic emulsion for use in paint that will compete with the currently popular rubber-base paints. It is claimed to have important advantages in this type of paint including excellent package stability, ease of application, fast drying, and easy stain removal after overnight drying.

Carbon White?

NOW available from Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass., is a white and almost pure form of silica, called Aerosil. The product is composed of particles of extreme fineness which can be easily dispersed and have an enormous surface area. Aerosil is expected to be useful in many industrial fields, but it is believed to be the answer to many compounders who have long dreamed of a "white carbon black" for use in rubber and plastics.

The product is effective as a thickening and gelling agent in all types of fluids. Water dispersions of Aerosil are easily prepared for use in



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emulsion paint, paper, latex, and other applications requiring aqueous systems. It can also be used as an anti-caking agent to improve the free-flowing properties of various powdered materials.

Vinyl Acetate Monomer

PRODUCTION of vinyl acetate monomer on a multi-million pound basis will start soon in the Celanese Corp. of America plant at Pampa, Texas. According to Richard W. KixMiller, general manager of the Chemical Div., the new plant "will give consuming industries a second domestic source of supply and will approximately double availability of vinyl acetate monomer."

Raw materials produced by Celanese at both the Pampa and Bishop, Texas, plants will be utilized in the production of the new chemical. A novel process, which was perfected by the company's research laboratories, will be used in making the vinyl acetate monomer; it is possible that lower costs are involved.

Production Reports

CHANGES are being planned for the monthly production reports on plastics and synthetic resins as published by the U. S. Tariff Commission. The first and most revolutionary change will be in the vinyl resin tabulation. Polyvinyl chloride and vinyl chloride-acetate copolymers will be separated from all other vinyls. The amount of resin used will be divided into the following categories:

Vinyl resins—Film under 0.010-in. gage; sheeting 0.010-in. gage; molding and extrusion; textile and paper treating; flooring; protective coatings; and all others. All other vinyl resins—1) adhesives; 2) all others.

The vinyl chloride breakdown is the same as the estimated report which has been used in the MODERN PLASTICS' review number each year, except that vinyl used for floor covering materials will be listed separately.

All other types of vinyls such as polyvinyl acetate-butyral-alcohol-formal will be lumped together, except for the amount used in adhesives which it is hoped can be segregated and reported in one category.

The other change to be made in the reporting of the Government's figures will be in miscellaneous phenolic resins which are to be separated into the following categories:

Resins for thermal insulation; resins for friction materials (brake linings, clutch facings, etc.); resins for coated and bonded abrasives; phenolic and other tar acid resins, in which classification casting resins will be listed instead of in molding materials where they are at present.

If there are any criticisms or suggestions from interested parties concerning these proposed changes, the U. S. Tariff Commission officials in Washington, D. C., would be interested in hearing them just as soon as possible.

Corrosion Resistance

ANOTHER material to inhibit corrosion of metal has been announced by Thompson & Co., 1085 Allegheny Ave., Oakmont, Pa. Designated as Vinsynite FS-3, it is formulated especially for roller coating on ferrous metals for use as an under or prime coat. In effect, it chemically pretreats the metal and covers it with a thin vinyl primer film in one operation.

More Branches, More Twigs

SOMETHING to ponder over in the future development of plastics was indicated in talks given by a team of research chemists of the Polychemicals Dept. of Du Pont at the recent American Chemical Society's meeting in Los Angeles. The point emphasized was that the molecules of many plastics have a heretofore unknown structural feature which, together with previously known characteristics of their make-up, may be tailored in the laboratory to give a range of materials as different physically as waxes and tough plastics. Most of the chemists' work had been with polyethylene, but the same sort of results may be applied to the vinyls, styrenes, and acrylics as well.

The discovery which they pointed out as most important was that the polyethylene molecule undergoes not one type of branching, as had been previously believed, but two. It not only exhibits long-chain branching, which was already known, but also has short-chain branches or twigs.

Because of these structural variables, it is believed that products ranging from waxes to tough plastics may now be synthesized from one material by controlling its molecular weight.

When this discovery is transferred from the test tube to commercial production facilities, it could mean that there will be scores of comparatively new materials on the market and that plastics can be tailored to meet the specifications of almost any job required.

EXPANSION

Monsanto Chemical Co. announces plans to boost its production capacity of formaldehyde by 50 percent. New facilities to produce the chemical will be added to its Plastics Div., Springfield, Mass. Production will start early 1954.

Lunn Laminates, Inc., Huntington, N. Y., has retained **Louis Jansen,** an architect, to plan an expansion move to increase the company's area by one-third. The additional space will house the trim and finishing sections of Lunn. This expansion will be the second within a year.

Minnesota Mining & Mfg. Co., St. Paul, Minn., has started production of various types of tape, including the new super-strength filament tape, in a new 325,000 sq. ft. plant at 6850 S. Harlem Ave., Bedford Park, Ill. **W. G. Bretson,** who has been with the company since 1942, is manager of the new plant.

Shell Chemical Corp., 50 W. 50th St., New York 20, N. Y., has brought on stream in its new plant at Houston, Texas, a supply of epichlorohydrin which it is believed will be enough for both the present and future needs of the nation for some time to come. Epichlorohydrin is a major component of epoxy resins and is also used in adhesives, chemical intermediates, and insecticides.

The raw material for epichlorohydrin is allyl chloride, of which Shell is the major producer, and plays a major role in Shell's glycerine pro-

Craftsman Power Lawn Mower made by Newark Stove Co., Ohio, for Sears, Roebuck and Co. Kralastic wheels molded by Ohio Plastics.

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They're so tough they'll bounce 10 feet high from a concrete floor—unharmed! They *resist chipping, cracking,* and *corrosion.* They're impervious to water, oil, grass stains, and chemical elements in the soil.

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duction. A part of the new epichlorohydrin production will be tied in with the manufacturing Epon resins which are now in scarce supply and will remain so until next fall, when Shell brings in its new bis-phenol and Epon resins at Houston.

COMPANY NOTES

Metro Dyestuff Corp., a subsidiary of Metro-Atlantic, Inc., Centredale, R. I., announces that **Dr. Harry W. Grimmel** has been elected president of its West Warwick, R. I., plant, and **John J. Fantry** has joined the company as chemist in charge of its newly formed textile pigments department at the Quidnick, R. I., plant. Dr. Grimmel was formerly manager of the Grasselli Dyestuff Corp. plant, Rensselaer, N. Y., and Mr. Fantry was with the research division of Sun Chemical Corp. It was also announced that **John J. Valter** has joined the Southern sales and service staff of Metro-Atlantic.

Metro manufactures vat colors, azoic colors, and pigment colors and clears under the respective trade names of Metrovats, Metrogens, and Metrotones.

Celluplastic Corp., Newark, N. J., has concluded a sales meeting and forum on "New Markets in Plastics" under the direction of **J. A. Connor**, vice president. In addition to an announcement concerning new items, the sales staff was addressed by the following speakers on markets for polystyrene, cellulose acetate, and nylon, respectively: **E. V. Hellyar, Monsanto Chemical Co.; E. V. Cronin, Hercules Powder Co.; and Dr. R. B. Akin, Du Pont.**

Koppers Co., Inc., Pittsburgh, Pa., announces the following appointments: **Carl H. Pottenger**, assistant sales manager of the Chemical Div., has been promoted to assistant vice president and division sales manager. He succeeds **T. C. Keeling, Jr.**, who resigned to become president of the **Hydrocarbons Div.** of **Mathieson Chemical Corp. J. W. Pool, Jr.**, chemical products manager, replaces Mr. Pottenger as assistant sales manager; **Harry P. Neher, Jr.** has been made assistant manager of the Central Staff Sales Dept., succeeding **Donald MacArthur**, who is now manager of Kopper's Washington office. **Thomas H. Cable** is now manager of the Sales Methods Section, a post formerly held by Mr. Neher. **Royce D. King**, manager of the Procurement Dept. for 24 years, has retired and **P. D. Shollar**, assistant manager of the department since 1937, steps in as manager.

St. George Textile Corp., 119 W. 40th St., New York 18, N. Y., has appointed **David M. Cooper** as head of its Industrial Fabrics Div. He will be in complete charge of sales and development work in connection with all weaving operations. The company has been active in the field of glass fiber products for the past 10 years. Mr. Cooper has served the Government as a textile expert in many capacities since 1942.

The Bilnor Corp. has moved to a new 85,000 sq. ft. plant at 300 Morgan Ave., Brooklyn 11, N. Y.

International Glass Corp. has recently purchased all the plant facilities and equipment of the Perrault Glass Fiber Corp., Newport, Ark. International has two other plants in Puente and South Gate, Calif. Executive offices and research laboratories are located at 8517 W. Third St., Los Angeles, Calif. The Arkansas plant produces fibrous glass, pipe wrap, outer wrapping for pipe, roofing material, battery retainers, battery separators, and an irrigation canal liner which has been recently tested in the California desert and found suited for the purpose.

All types of plastic reinforcing mats and continuous fibrous glass will also be made at the Puente plant, as well as allied products that the company's engineers are developing at the present time.

Roy J. Scott is president of International. He was formerly associated with **Owens-Corning Fiberglas Corp.** and later organized Glasflos Co., Hicksville, L. I.

Sun Rubber Co., Barberton, Ohio, announces that the process and apparatus by which the company's vinyl toys and dolls are manufactured are now fully covered by U. S. Patents No. 2,629,131 and No. 2,629,-134. Some years ago the company had designed and built new high-speed molding equipment utilizing spinning molds and has kept the equipment a closely guarded secret.

Farrel-Birmingham Co., Inc., Ansonia, Conn., showed a billing of $32,-567,492 for 1952, an increase of 27% over the previous year's figure of $25,498,754.

This year's report announces the resignations as directors of **Franklin Farrel, Jr., William A. Gordon**, and **Fernley H. Banbury**. Mr. Farrel served on the board for 48 years; Mr. Gordon is the inventor of the Gordon plasticator; Mr. Banbury is the inventor of the Banbury mixer. These men had active association with Farrel-Birmingham for 47 and 35 years, respectively.

Brilhart Plastics Corp., Mineola, N. Y., voted a semi-annual dividend of 12½¢ per common share on the 249,896 shares of common stock (25¢ par value) presently outstanding, payable March 16, 1953 to holders of record March 2, 1953. Dividends were resumed in August 1952 when the Board of Directors declared an initial semi-annual dividend of 12½¢ per common share.

Wilmod Co., Plastics Div. has moved its offices and warehouse to 2488 Dufferin St., Toronto 10, Ontario.

Pantasote Co., 26 Jefferson St., Passaic, N. J., announces the appointment of **Eliott W. Howard** as sales manager. Among his former affiliates are **Dewey & Almy Chemical Co.** and **Firestone Rubber Co.** In addition, Mr. Howard is vice president and sales manager of H. O. Canfield of Bridgeport and vice president of H. O. Canfield Plumbing Supply Co., positions which he will retain.

The Colton Chemical Co., 1545 E. 18th St., Cleveland 14, Ohio, has announced that Colfoam insulation, a urea formaldehyde plastic foam, has been reduced by 3¢.

Barrett Div., The Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y., has purchased **Synvar Southern Corp.**, Greensboro, N. C., a wholly-owned subsidiary of Synvar Corp., Wilmington, Del. The Greens-

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boro plant manufactured and sold urea resins to the plywood, furniture, and textile industries in the Southern territory only.

The sale of the Southern plant does not affect Synvar's operations. Synvar's plant at Wilmington will continue to expand its present complete line of phenolic and urea-type resins, as well as its line of phenolic molding compounds.

Calresin Corp., Arcadia, Calif., and Ottumwa, Iowa, has appointed **Robert Strong** as sales manager of its Encapsulating Division.

Poly Plastic Products, Inc. is now located at 2-8 Fourth Ave., Paterson 4, N. J.

Canadian Resins and Chemicals Ltd., 600 Dorchester St. West, Montreal, Quebec, has appointed **Kenneth B. Mathewson** as manager of the Industrial Products Div. and **William E. Lynes** as manager of the Consumer Products Division.

Synthane Corp., Oaks, Pa., has assigned **Oliver L. Smith** to its New York district sales staff.

National Polychemicals, Inc., recently organized New England company, has moved into its new offices and laboratory at Eames St., Wilmington, Mass. The company manufactures specialty organic chemicals.

Logo, Inc., 13799 South Ave. O, Chicago 33, Ill., a subsidiary of Bee Chemical Co., announces the following appointments: **Nathaniel Willis** has been named manager of quality control; **John Scharnberg**, sales development engineer; and **A. L. Kruszynski**, production superintendent.

Marco Chemicals Inc., Linden, N. J., announces the development of a new polyester resin which will not drain even from smooth vertical surfaces. Designated as Marcothix Resin #1, it completely overcomes the drainage problem which has long been considered the most serious drawback in producing molded laminates such as boat hulls, auto bodies, aircraft parts, and tanks by hand lay-up methods. It greatly simplifies application of protective coatings to storage tanks, cinder block, concrete and various contoured objects.

Auburn Button Works, Inc., Auburn, N. Y., announces that **Nat A. Freuden** has joined the sales staff of the company. He will provide additional sales service in New England where William E. High will continue to represent Auburn. Mr. Freuden will also represent the company in the Hudson River area of New York State above Westchester County. He was formerly associated with **General Electric Co.** for 13 years.

Norco Plastic, Inc., 3888 N. Fratney St., Milwaukee 12, Wis., has made the following change in management: **Edward C. Berg**, formerly secretary, succeeds Peter W. Heckel, who has resigned; **D. P. Becker** is the new secretary-treasurer; and **Leo R. Lichter**, vice president.

Hoosier Cardinal Corp., Evansville, Ind., and **Gits Molding Corp.**, Chicago, Ill., have agreed to exchange licenses under patents relating to the decoration of transparent articles by the reverse intaglio process. Hoosier Cardinal has received a license under the J. A. and J. P. Gits patent No. 2,354,857 and has granted Gits a license under the C. A. Bauer patent No. 2,490,900.

Maas & Waldstein Co., 2121 McCarter Highway, Newark 4, N. J., has appointed **Mrs. Adela Heribert** as sales and service representative specializing in printing inks for use on plastic sheeting. Mrs. Heribert is credited with the inventions of a process for pretreatment of polystyrene in preparation for printing, a machine making tear-proof holes in vinyl sheeting, and an attachment for heat sealing equipment to make ruffles on polyethylene.

American Wheelabrator & Equipment Corp., Mishawaka, Ind., announces the following appointments: **K. E. Blessing** as district manager and **F. John Pichard** as sales engineer of the company's sales office at 53 Newark St. Bldg., Hoboken, N. J.; **George F. Burditt** as district manager of the Pittsburgh sales office, 91 Central Sq.; and **George C. Tolton**, district manager of the company's office at 211 W. Sycamore, Greensboro, N. C.

Bell Mineral Corp. with a plant in Paris, Me., was organized in January 1953. **Richard Bell** of Bell Clay Co., Gleason, Tenn., was elected president of the new company, and **W. Wallace Roff** of Whittaker, Clark & Daniels, Inc., 260 W. Broadway, New York 13, N. Y., as vice president. Whittaker, Clark & Daniels has been appointed Eastern sales representative for Bell Mineral Corp., which manufactures Oxford high grades of feldspar used for fillers in plastics.

Bakelite Co., a Div. of Union Carbide and Carbon Corp., has established a sales office at 82 St. Paul St., Rochester 4, N. Y. **V. E. Serrell**, technical representative of the Molding and Extrusion Materials Div., has been assigned to this office.

American Cyanamid Co.'s Plastics Dept. is now producing Urac 180 resin adhesive at its Charlotte, N. C. plant. In addition to this urea-formaldehyde resin, catalysts for any type of wood gluing operation are available from the Charlotte plant.

Alsynite Co. of America, San Diego, Calif., and Portsmouth, Ohio, has named **Robert W. Muir** sales representative to direct sales operations in California, Arizona, New Mexico, Nevada, and Utah. His headquarters will be in the Guaranty Bldg., 6331 Hollywood Blvd., Hollywood, Calif.

The company also announces that **Pralcoa**, 2303 Second Ave., New York 35, N. Y., has been appointed Alsynite's distributor for the New York City area.

PERSONAL

Ludlow King has been appointed vice president of **Universal Moulded Products Corp.'s Plastics Div.**, Bristol, Va., with offices at 1001 Connecticut Ave., Washington, D. C. He was formerly affiliated with **Owens-Corning Fiberglas Corp.**

Daniel D. Lewis has joined **Durable Formed Products, Inc.**, 6 Greene St., New York 13, N. Y., as technical salesman.

Jack Whitehead of the Kerr Panel Div. Research Dept. of **Alexander H. Kerr & Co.**, Burbank, Calif., has

YOU ASKED FOR IT... *Here It Is!*

The *Latest Thing* in Plastic Molding

D-M-E's *NEW* 9" x 8" A-R Series Standard Mold Base

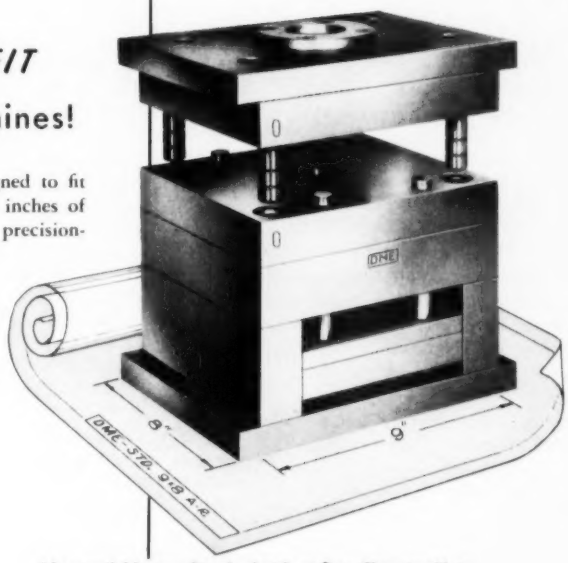
ENGINEERED TO FIT

Small Injection Machines!

This NEW standard has been designed to fit injection presses having as little as 8 inches of tie bar clearance! But, between those precision-built leader pins is over 48 Sq. Inches of USEABLE CAVITY AREA! This new series can handle bigger molding jobs with greater savings.

It's built with the same High Quality Steels and precision construction as D-M-E's regular outstanding line of standards.

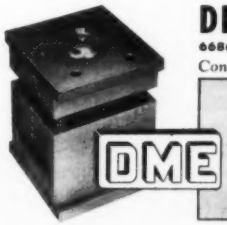
YES, You asked for it . . . Here it is! Your answer to many a mold-designer's problem!



Also available as a Standard without Rear Clamping Plate.

Write TODAY for Data Sheet 98-AR giving complete specifications and prices.

The *Originators* OF STANDARD MOLD BASES



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Contact Your Nearest Branch FOR FASTER DELIVERIES!

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CHICAGO 44, ILLINOIS 5315 W. LAKE STREET, COLUMBUS 1-7855
CLEVELAND 14, O.—D-M-E CORP. 5473 LAKE CT., ENDICOTT 1-0907
LOS ANGELES 7, CAL. 3700 SOUTH MAIN STREET, ADAMS 3-8214

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been appointed sales engineer and transferred to the executive offices at 3440 Wilshire Blvd., Los Angeles 5, Calif. Mr. Whitehead will supervise distribution plans for Rippolite corrugated plastic structural panels.

Ned P. Kimberly, chemical engineer and glass technologist of **Libbey-Owens-Ford Glass Co.** is now sales representative of the **Fiber Glass Div.** of the company in the Cleveland, Ohio, area with offices at 1302 Terminal Tower Bldg., Cleveland.

E. B. Lombard, formerly with L. A. Goodman Mfg. Co., is now sales engineer of **Midwest Plastic Products Co.**, 1801 Chicago Rd., Chicago Heights, Ill.

Leonard S. Meyer has resigned as head of the Plastics Div. of Western Products, Inc., Newark, Ohio. After vacation, Mr. Meyer will accept consulting work on a limited basis. He may be reached at 95 N. Sixth St., Newark, Ohio.

John D. Fennebresque, vice president and assistant to the president of **Celanese Corp. of America**, 180 Madison Ave., New York 16, N. Y., has been elected to the board of directors of the company.

Dr. Turner Alfrey, Jr. has been named assistant director of the Physical Research Laboratory at **The Dow Chemical Co.**, Midland, Mich. He was formerly affiliated with the Polytechnic Institute of Brooklyn as a professor of polymer chemistry and assistant director of polymer research, and with **Monsanto Chemical Co.'s Plastics Div.**

George Flanagan, who had been loaned to the Plastics Section of NPA by **B. F. Goodrich Chemical Co.**, has served his term in that capacity and will now become Goodrich's representative in Washington, D. C.

George W. Howard of **Engineer Research and Development Laboratories**, Fort Belvoir, Va., well known to many in the plastics industry for his interest in plastics, has been awarded a $15,000 Rockefeller Public Service Award. The award will enable Mr. Howard to spend a year visiting Government and private research and development agencies in this country and abroad to study methods of direction, planning, and management.

Mrs. Charlotte L. Kraemer, president of **New England Roto-Engraving Co.**, 102 Cabot St., Holyoke, Mass., has recently made a business trip to Europe for the purpose of visiting with customers who are in need of roto engravings for printing on vinyl sheet. Just before Mrs. Kraemer left, the company delivered $5,000 worth of engravings to Italy.

Vincent H. Post, a Bakelite staff technical writer, has been appointed editor of **Bakelite Review**, replacing Stephen J. Wilson, who is leaving the company.

Michael A. Brown, Jr., formerly sales manager of **Plaskon Div., Libbey-Owens-Ford Glass Co.**, Toledo, Ohio, has been named manager of sales of **Rayonier, Inc.**, 52 Vanderbilt Ave., New York 17, N. Y. Mr. Brown joined the company a year ago, directing the sales promotion, public relations, and advertising programs, and will continue to direct these activities in his new position.

Albert B. Diss is now vice president and general manager of **The Watson-Stillman Co., Div. of H. K. Porter Co., Inc.**, Roselle, N. J. He will be in complete charge of all manufacturing and sales operations.

R. B. Waters has been named sales engineer of **Thompson & Co.**, Oakmont, Pa., with headquarters in Cleveland, Ohio. He will sell and service the complete Thompson line of industrial coatings, including electrical insulation varnishes and the Vinsynite series of metal pretreatments. Mr. Waters was formerly affiliated with the **Surface Coatings Div. of Bakelite Co.**

Harry W. Cyphers, Jr. has been appointed manager of the newly formed advertising and sales promotion department of **American Cyanamid Co.'s Plastics and Resins Div.**, 30 Rockefeller Plaza, New York 20, N. Y. He was formerly sales promotion manager of the company's plastics department.

Ralph W. Burdeshaw, who for 9 years has been active in sales of industrial resins of **Plaskon Div., Libbey-Owens-Ford Glass Co.** in southern states, has been named manager of distributor sales for the southeast region of the company's Corrulux Division. Mr. Burdeshaw will have his headquarters in the Whitehead Bldg., Atlanta, Ga.

R. F. Vokes has been named general manager of **Dilts Machine Works Div., The Black-Clawson Co.**, at Fulton, N. Y.

DECEASED

Harry C. Richards, Sr., executive vice president of **Foster Grant Co., Inc.**, Leominster, Mass., died on February 27 as a result of an automobile accident. Mr. Richards had been associated with the company for 22 years.

George E. Griffin, technical sales representative of **Harwick Standard Chemical Co.**, Akron, Ohio, died from a heart condition while on vacation at Fort Lauderdale, Fla.

B. Huntting Howel, president and founder of **Garfield Mfg. Co.**, Garfield, N. J., died on February 26. He was responsible for the introduction of the cold molding process in this country.

MEETINGS

April 26-29—American Institute of Chemical Engineers, Royal York Hotel, Toronto, Ontario.

May 9-15—Society of the Plastics Industry, Annual Meeting and Conference, Cruise to Bermuda.

May 20-22—Society for Experimental Stress Analysis, Spring Meeting, Hotel Schroeder, Milwaukee, Wis.

S.P.E. Meeting

May 13—Paul West, Taco West Corp., will address the Newark Section on "Temperature Control." In addition, there will be a description of the operation of the Glengarry precision charging unit for injection machines. The meeting will be held at the Military Park Hotel, Newark, N. J.

Du Pont Announces . . .

HIGHER WET AND DRY STRENGTH IN

GLASS FABRIC LAMINATES

NOW POSSIBLE WITH NEW PROCESS FOR USING

Du Pont "VOLAN"

METHACRYLATO CHROMIC CHLORIDE

Laminates made with glass fabric treated with "VOLAN" by the new method exceed the new rigid requirements of military specification MIL-P 8013 (USAF)

A new method for applying "Volan" to glass fabrics—developed by Du Pont—now enables you to improve both wet and dry strength of glass-fabric-reinforced resins. Glass fabric (181 style) properly treated with Du Pont "Volan"* Methacrylato Chromic Chloride will produce laminates with dry flexural strengths in the range of 70,000 to 74,000 psi. Boiled for three hours and tested wet, these laminates show flexural strength of 55,000 to 60,000 psi.!

MAIL COUPON FOR FULL DETAILS. We'll send you complete data on "Volan"—how it helps produce strong laminates when applied by the new method—sources of supply of glass fabrics treated with "Volan." Just fill in and mail coupon today. *REG. U.S. PAT. OFF.

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Wilmington 98, Delaware

Please send ( ) data on the new method of application

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MACHINERY and EQUIPMENT FOR SALE

FOR SALE: Quick delivery Rubber and Plastic Equipment. Farrell 16"x48", and 15"x36", 2 roll rubber mills. Other sizes up to 84". New Seco 6"x12" and 6"x16" Lab. Mixing Mills and Calenders. Rubber & Plastic Extruders. HPM 200 ton Hydr. Press 4 opening, 32"x50" platens. 200 ton Brunswick 21"x31" Platens, 14" Ram. Record Presses. Wat.-Still. 100 ton 24"x24". Elms 75 ton 30"x36". Also presses Lab. to 2000 tons from 12"x12" to 48"x48". Hydr. Oil Pumps. Gould 75 HP motor Dr. 2 stage Centrif. Pump 250# W.P. W.S. 4 Pigr. High and Low Pressure Hydr. Pump. HPM 5 GPM 2700 lbs. Elmes Hor. 4 Pigr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & Single Punch Preform Tablet Machines ½" to 3". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins Jacketed Mixers 100, 50, and 9 gal. Plastic Grinders. Heavy duty mixers, grinders, pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 107-8th Street, Brooklyn, 15, N. Y., STerling 8-1944.

SAVE WITH GUARANTEED REBUILT EQUIPMENT—RUBBER MIXING MILL, heavy duty 18"x48"; HYDRAULIC PRESSES: 28"x25", 750 ton, 18" ram. HOBBING, 26"x18", 12" main ram, TRANSFER, 170 tons; 20"x20", 10 ram 118 tons, 24"x20", 10" ram, 118 tons; 20"x20", 10" ram, 200 tons, 30"x20" 8" ram, 75 tons, 15"x15", 8" ram, 75 tons, 19"x24", 10" ram, 78 tons, 12"x12", 6½" ram, 50 tons, 14"x14", 8" ram, 50 tons, 8"x9½", 4½" ram, 20 tons, 16"x16", 3½" ram, 12 tons; LABORATORY PRESSES: Carver, model 150, 10 ton. Buehler 10"x7" 12 ton; NEW UNIVERSAL DUAL PUMPING UNITS: 3 to 15 HP; NEW LABORATORY MILLS & CALENDERS; EXTRUDERS: Royle #1 Plastic, insulating type, NRM, 6", strainer type: ACCUMULATOR HPM 6" ram, 2500#, PREFORM PRESSES all sizes, also Mixers, Vulcanizers, Injection Molding Machines, etc. UNIVERSAL HYDRAULIC MACHINERY CO., INC., 285 Hudson St., New York 13, N.Y.

Partial list of available machines, may be inspected in operation: 60 ounce Jackson & Church, new 1950. 48 ounce Lester, almost new. 22 ounce Impco vertical, $16,000. 20 ounce Lester, 1949. 16 ounce New injection molding machine, $16,000. 16 ounce Lester with 4 extra cyls., new 1944, $14,000. 12 ounce Lester w/extra cyl., $10,000. 12 ounce Watson-Stillman, 1948. 12 ounce Reed-Prentice. 12 ounce Fellows-Leominster, new 1950, $17,500. 9 ounce H.P.M. w/12 ounce cylinder, $7,500. 8 ounce Watson-Stillman, 1944, $7,000. 8 ounce Leominster, new in 1947, flange type cyl., $8,000. 8 ounce Hy-Mac, new 1946, $6,500. 8 ounce DeMattia, 1946, $8,500. 8 ounce Leominster, 1946, $7,500. 8 ounce Reed-Prentice. 7 ounce H.P.M., 1940, $6,500. 6 ounce Watson-Stillman, $4,500. 6 ounce Reed-Prentice, new 1938. 4 ounce Lewis. 4 ounce Windsor, Model SH4, new 1952. 3 ounce Fellowe, 2 years old. 8 ounce Reed-Prentice cylinders, $600. each. 8 ounce Leominster cylinder, $375. 2000 Ton Hydraulic Press. 300 Ton Stokes Press. 350 Ton Hydraulic Press. We also have available several compression, transfer and preform presses. ACME MACHINERY & MFG. CO., 102 Grove St., Worcester, Mass. Wor. 7-1529.

WE HANDLE HYDRAULIC PRESSES, pumps, and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. HYDRAULIC SAL-PRESS, INC., 356-90 Warren Street, Brooklyn 2, N. Y. MAin 4-7847.

FOR SALE: 1—6"x12" Lab. Roller Mill; 1—Baker Perkins Banbury type 10 gal. Mixer, with pressure cover, m.d.; 4 Bolling 18"x18" 5-opening Hydraulic Presses; 1—HPM 4-oz. Injection molding Machine; 2—Ball & Jewell Rotary Cutters; 1—100 gal. Patterson Kneadermaster S/S Mixer; 1—Eureka Rotary Cutter; 1—500 gal. Patterson Reaction jack. agit. Resin Kettles; 7—Dry Mixing Blenders, up to 11,000#; 1—NRM 1" electric heated Plastic Extruder; 2—Day Roball 82 Sifters, 40"x120" screens; 2—Rotex #12, 20"x37" screens; 1—Retex 30"x48" Sifter; 3—Mikro Pulverizers 2TH, 3TH, 2DH. Also Grinders, Extruders, Compression and Injection Molding Presses, etc. Send us your Inquiries. Advise us what you have for sale. CONSOLIDATED PRODUCTS CO. INC., 13-14 Park Row, New York 38, N. Y. BArclay 7-0600.

FOR SALE: 1—RC 100 WINDSOR TWIN SCREW EXTRUDER, complete with 10 H.P. G.E. A.C.A. motor and controls. 1 year old, A-1 condition. Original cost: over $12,000.00. 1—AMERICAN PULVERIZER PLASTIC GRANULATORS. Type KC 9x9, ser. #3177 and #3178, throat opening 10" x 6¼", complete with stand, sheave, V-belts, screen and hopper, can be easily cleaned. Rugged construction. 2 years old. Used very little; excellent condition. Original cost: $1,000.00. 1—BRUNNER AIR COMPRESSOR. 2 H.P., mounted on channel iron base. Model #A-2000, 11.7 cu. ft. displacement. 220-440V, 60-cycle, 3-phase motor, 150 psi, with pressure switch and separate receiver tank; Excellent Condition. Price: $250.00. Following Items to be sold for BEST OFFER: 100,000 HOLLOW ACETATE BALLS, 1" diameter, various colors. 350,000 ½" diameter GLASS BALLS, various colors. 50,000 1" CATALIN BALLS, various colors. 125,000 ⅞" CATALIN BALLS, various colors. 9,000 BELLS, ¼" and ¾". All items may be inspected by appointment only. Terms F.O.B. our dock, net cash. All items sold as is, subject to prior sale. Inquire Mr. Bill Foss, SANDEE MANUFACTURING COMPANY, 5050 Foster Avenue, Chicago 30. Phone: AVenue 3-2860.

FOR SALE AT GREAT SAVINGS: Colton 2 and 3 RP Rotary & 4T Tablet Machines. Mikro (S.S. also), 1SH, 2TH, 3TH, 4TH Pulverizers; Schutz O'Neill Mills. Baker Perkins & Readco Heavy Duty Steam Jacketed, Double Arm 50, 100, 150 gal. Mixers. Baker Perkins 150 gal. D.A. Unidor Jacketed Mixer. Baker Perkins 100 gal. D.A. Vacuum Mixers. J. H. Day, from 5 up to 75 gal., Imperial and Cincinnatus D.A. Jacketed Sigma Blade Mixers. Day & Robinson 100 up to 10,000 lbs. Dry Powder Mixers. Abbe Engineering #10 Rotary Cutter. Package Machy. FA, FA4, Miller, Hayssen 3-7, Scandia auto. Wrappers. Hudson Sharp Campbell auto. Cellophane Wrapper. Rebuilt and Guaranteed. This is only a partial list. Over 5000 machines in stock—available for immediate delivery. Tell us your machinery requirements. UNION STANDARD EQUIPMENT CO., 318-322 Lafayette St., New York 12, N. Y.

FOR LEASE, RENT OR POSSIBLE SALE: New 74" Plastic Extruder, all necessary lamination and slitting equipment, active contract polyethylene, all equipment in A-A-1 building, low insurance, ample storage space, air-conditioned offices, Railroad Siding, experienced help and management, equipment in operation. Reason for action: Partner retiring but other operations in another part of large building will continue. Reply Box 515, Modern Plastics.

FOR SALE: 1—Ball & Jewell No. 1½ Rotary Cutter, stainless steel. 4—Mikro Pulverizers #1-SH, #1-SI, #2-SI, #2-TH. 2—Kux Rotary Pellet Presses. 4—Stokes D-3 Rotary Pellet Presses. Read 400 lb. Jacketed Ribbon Mixer. Large stock Stainless Steel Tanks and Kettles. PERRY EQUIPMENT CORP., 1429 N. 6th St., Phila. 22, Pa.

FOR SALE: Reinforced Plastics Press 54" x 144". Injection Presses: 4 & 9 oz. HPM, 6 oz. Watson, 16 oz. Impco VF 822. 1 & 2 oz. Van-Dorn. 4 oz. Makray. Extruders: 3½" NRM, Royle No. 1 Wire cov. unit, oil heated. Stokes-Windsor RC 100, twinscrew. 1—½" Modern Plast. w. crosshead. 1—Conveyor 22"x12". Scrap-grinders. Ovens. Transfer & Compression presses. 2—250 tons Compr. presses. 3, 12 & 50 t. Lab presses. Preform presses: Stokes 28o C—Colton 5½ T. Kux No. 25. Sheridan Embosspress No. 9. 42" Slitting & Rewind. machine. 3 HP Ganboilers. List your surplus equipment with us. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13, Ill.

FOR SALE: 28 Ton WS 18"x18" Platen, 50 Ton PRESS 20"x20" Pl., 75 Ton WS 15"x15" Pl., 140 Ton WS 23"x17" Pl., 150 Ton HPM Triple Action 36"x36" Pl. 175 Ton HPM 30"x30", 250 Tons WS 28"x24". 300 Ton WS 20"x20". 300 Ton WS 24"x29" Platen. 8-oz. WS, 9-oz. HPM, 4 oz. DeMattia Injection Molding Machines. Accumulators. Laboratory Presses, Platens & Oil Pumps, Pulverizers, Scrap Cutters, Grinders, Ball & Jewell, Cumberland, AARON MACHINERY CO., INC., 45 Crosby St., New York 12, N. Y. WOrth 4-8233.

FOR SALE: 6—Reeves Drives, size 4343-C-18, Ratio 189:1, maximum output 18.4 rpm, minimum 3.07 rpm, 2 hp, 220/440 volt, 60 cycle, 3 phase, 1735 rpm motor. 8—General Electric 10 hp, 220/440 volt, 60 cycle, 3 phase, 1160 rpm motors. 12—Galland Henning air cylinders, double acting, foot mounted, Clevis end rods, 8" bore x 20" stroke. Reply Box 528, Modern Plastics.

ATTENTION: COMPRESSION MOLDERS. We have one practically new Pill Heating Despatch Oven, 9 sliding shelves with Parplow automatic temperature control. Many extras. Will sacrifice. Write Box 8850, 217 7 Ave., New York.

FOR SALE: 1—4 oz. Watson Stillman Injection Molding Machine complete with instruments, good condition. Can be seen in operation. Price $4,000. BACHMANN BROS., INC., 1400 E. Erie Avenue, Phila., Pa.

FOR SALE: Six used automatic electric record perform ovens in working condition. Stainless steel drawer, 14" x 23". Attractive price. Reply Box 529, Modern Plastics.

HIGH PRESSURE BOILER: 15 H.P. 200 lb. pressure, completely automatic. Eclipse, gas fired, vertical. Feed pump and Tank. Excellent condition. $1200. WALTERS CHEMICAL CORPORATION, P. O. Box 0, Avon-by-the-Sea, N. J.

FOR SALE. One 8-oz. Leominster Injection Molding Machine—1946 Model—Good running condition. Price—$7,500.00. PLASTICRAFT MFG. CO., 287 Laurel Ave., Arlington, N. J.

MACHINERY and EQUIPMENT WANTED

WANTED: Banbury Mixers, Heavy Duty mixers, Calenders Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider an operating or shut down plant. P.O. Box 1351, Church Street St., New York 8, N. Y.

WANTED: Plant or Machinery including Rubber Mills, Hydraulic presses, Sturdy mixers, Calenders, Banbury mixers, Pulverizers, Grinders, Rotary cutters, Extruders, Screens, Injection Molding machines, Dryers. CONSOLIDATED PRODUCTS CO. INC., 13-14 Park Row, New York 38, N. Y. BArclay 7-0600.

(*Continued on page 220*)

CLASSIFIED ADVERTISING

(Continued from page 218)

WINDSOR PLASTIC injection-molding machine wanted; 30-40 gr. in good condition; complete with up-to-date forms if possible. Send price and description to Mr. Halvor Kviale, CONSULADO DE NORUEGA, Poste restante, Caracas, Venezuela.

WANTED: Plastic injection moulding machines. Get our offer before you sell. ACME MACHINERY & MFG CO., 102 Grove St., Worcester, Mass.

WANTED: NEW OR USED 2½" or 3½" N.R.M. extruders. Also parts such as cylinders, etc. ANCHOR PLASTICS CO., Telephone: RAvenwood 9-1494, Extension 1, Long Island City, N. Y.

WANTED: YORK 4 OUNCES, INJECTION MOLDING MACHINES. Reply Box 534, Modern Plastics.

WANTED: Steam Platen, hydraulic, laminating press, complete; 60"x60" or better—3 or more openings—500 psi on work—Submit full particulars, approx. location, price and photo, if possible. Reply Box 539, Modern Plastics.

PLANT FOR SALE

FOR SALE
Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars, reply Box 538, Modern Plastics

MATERIALS FOR SALE

THREE THOUSAND POUNDS Virgin Pink Polystyrene, 28¢ lb. 1000 lbs. Virgin Maroon Polystyrene, 28¢ lb. 6000 lbs. Virgin Baby Blue Hi-Impact, 28¢ lb. 3000 lbs. Reground Gray Polystyrene, 27¢ lb. 3000 lbs. Reground Light Blue Polystyrene, 27¢ lb. 3000 lbs. Reground White Polystyrene, 29¢ lb. 2000 lbs. Virgin HM 140 Amber Lucite, 35¢ lb. 1500 lbs. Virgin HM 140 Trans. Red Lucite, 35¢ lb. 3000 lbs. Virgin Peach Cellulose Acetate, 30¢ lb. 2000 lbs. Reprocessed Amber Cellulose Acetate, 30¢ lb. 2000 lbs. Type #206 Black Tenite II, 35¢ lb. CLAUDE P. BAMBERGER, INC., 152 Centre Street. Tel. MAin 5-5553. Brooklyn 31, N. Y.
Not Connected with Any other firm of similar name.

FOR SALE by Custom Coloring House—Reprocessed: Cellulose Acetate—All colors for all applications—large or small quantities. Special whites. Cellulose Acetate Butyrate—Many colors and flows. Polystyrene—All colors—large or small quantities. All other thermoplastics—all colors and quantity size. Job lots of all materials—virgin and reground. All materials guaranteed. Reply Box 538, Modern Plastics.

ACETATE MOLDING POWDER: white, ivory, red, blue, green and pastel colors, 28¢ per pound; 8500 pounds Celanese White Acetate Molding Powder, medium soft flow, original sealed drums, 32¢ per pound F.O.B. New York: Three steel molds for complete Baby Toilet Seat—$2500.00: Immediate shipments from regular inventory. PEERLESS CHEMICAL CORP., 110 Bleecker Street, N.Y.C.-12.

FOR SALE: Dow's Hi-Impact Styrene. Material all first reground and clean. Steady quantities. Reply Box 547, Modern Plastics.

MATERIALS WANTED

WANTED: PLASTIC SCRAP OR REJECTS in any form. Also surplus and obsolete lots of virgin molding powders. We also custom reprocess your own scrap. A. BAMBERGER CORP., 703 Bedford Ave., Brooklyn 6, N. Y. Telephone: MAin 5-7450.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic, Ethyl Cellulose. Reply Box 523, Modern Plastics.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. FRANKLIN JEFFREY CORPORATION, 1671 McDonald Avenue, Brooklyn, N. Y., ES 5-7943.

WANTED—NITRATE (CELLULOID) SCRAP, also all thermoplastic scrap. Any type rejects. High prices paid. Reply Box 509, Modern Plastics.

WANTED: PLASTIC SCRAP such as Cellulose Acetate, Vinyls, Acrylic, Ethyl Cellulose, Polystyrene, Butyrate, etc. We also buy surplus inventories of molding powder or grind, clean and reprocess your own scrap. CLAUDE P. BAMBERGER, INC., 152 Centre St., Brooklyn 31, N. Y., Tel. MAin 5-5553. Not connected with any other firm or similar name.

WANTED: SURPLUS UREA molding powder. Reply Box 527, Modern Plastics.

WANTED: THERMOPLASTIC SCRAP of any description. Excellent prices paid for your vinyl, acetate, butyrate, polystyrene, polyethylene, acrylic and nylon scrap or rejects in any form shape or color. Shipping to us is no more trouble than shipping to any U.S. point. For best prices for your plastic scrap contact: KAYSON RUBBER & PLASTICS LIMITED, Galt, Ontario, Canada.

MOLDS FOR SALE

FOR SALE: Very cheap, 5 injection molds plus a good quantity of components. Molds are for a 5" round compact—a flat cigarette case—a square cigarette box—a piano cigarette box and a 16 cavity mold for midget wind-up cars. Prices and additional information upon request. Box 269, Dept. W, Erie, Pa.

MOLDS WANTED

BRUSH MOLDS AND BRUSH MACHINERY—Injection molds for ladies', men's, military, nail, tooth brushes, etc. Send particulars and samples. Reply Box 743, REALSERVICE, 110 W. 34 St., New York, N. Y.

MOLD WANTED for injection molding. We will buy one mold or a complete line or series of molds for finished resaleable items. Housewares, toys, novelties, etc. Will also buy molds for industrial parts such as handles, knobs, drawer pulls, gears. All items for resale in U. S. A. Send detailed information to VICTORY MANUFACTURING COMPANY, 1722 W. Arcade Place, Chicago 12, Illinois.

MOULDS WANTED for compression moulding of Radio Cabinets. The design must be modern. Submit quotations enclosing illustrations of Radio Cabinets to: Chassay Bros. (Pvt) Ltd., SUPERSONIC INDUSTRIES, Ingutsheni Road, Light Industrial Sites, Bulawayo, Southern Rhodesia.

HOUSEWARES AND GIFT item molds wanted for injection molding. Will buy or trade for lamp part molds or other molds we have available. Send complete detailed information of what you have to offer to: SUPERIOR PLASTICS, INC., 426 No. Oakley Blvd., Chicago 12, Illinois.

HELP WANTED

CHEMIST OR CHEMICAL ENGINEER: Expanding chemical manufacturer in Metropolitan N. Y.-N. J. area has openings for men with one to four years experience in plastics testing and evaluation. Experience in processing, testing, and application of vinyl resins, plasticizers and/or reinforced polyester resins required. Submit detailed resume of training, industrial experience and salary requirements. Reply Box 507, Modern Plastics.

CHEMIST—Well experienced in vinyl film and sheeting—excellent opportunity. Reply Box 506, Modern Plastics.

PLASTICS ENGINEER wanted by midwestern aircraft manufacturer. Must have working knowledge of injection and compression molding, low pressure Laminating, Acrylic and Royalite Fabrication. Engineering degree desirable. Work will consist of—design consultation, development, and occasional technical assistance to shop. Write giving education, production and/or design experience and salary expected for 40-hour work. Reply to P. O. Box 85, Wichita 1, Kansas.

RESEARCH AND DEVELOPMENT DIRECTOR . . . to build and direct a staff to undertake an expanding program in the development and application of synthetic polymers in the field of plastics, coatings and related uses. Experience in this field is essential. This is an unusual opportunity for a man who has demonstrated success and accomplishment in directing polymer research. This position will be located in our modern laboratory at Summit, New Jersey. Full details of education, experience, accomplishments and salary expected should be included in your letter, which will be treated in confidence. Write to: Personnel Department, CELANESE CORPORATION OF AMERICA, Plastics Division, Newark 5, New Jersey.

SUPERVISOR—PLASTIC PROCESSING DEVELOPMENT WORK.—Man with technical degree plus three to ten years of pertinent experience wanted to supervise the experimental molding, extrusion, fabrication and evaluation of plastics. Part of time to be devoted to liasion work with Plastics Sales development group of company. Challenging work with good opportunities. Salary commensurate with background and experience. Reply Box 546, Modern Plastics.

PRODUCT MANAGER OR ENGINEER OR CHEMIST with knowledge of vinyl film printing, embossing and laminating. Must have thorough know-how equipment and operation of vinyl film printing plant. Salary $8,000-$12,000. Reply Box 530, Modern Plastics.

TECHNICAL SALESMEN WANTED—Position open with large Midwest color manufacturer to head up color sales to the plastics and rubber industries. Must have some experience in the use of color in the plastics and rubber fields. Excellent opportunity for right man to really grow with our organization. Plant in New York City. All replies will be held in confidence. Reply Box 544, Modern Plastics.

LAMINATING WORKING FOREMAN, assume full responsibility for production and quality. Working in thermoplastics, paper laminates, rigid vinyl, plaques, lucite, impregnated papers. Wonderful opportunity for right man to really grow with our organization. Plant in New York City. All replies will be held in confidence. Reply Box 544, Modern Plastics.

SALES REPRESENTATIVES WANTED. Established, fully equipped Fabricating Plant in New Jersey desires Sales Representatives. Good chance for established Injection Molding representatives, now calling on the trade, to earn extra income. Write giving experience and present connections. Reply Box 517, Modern Plastics.

FAST EXPANDING customer extrusion business is seeking sales representation. Several territories open. Reply Box 513, Modern Plastics.

PLASTIC MOLDING MACHINE FOREMAN. Day shift Foreman in charge of Compression and injection molding machines. Must have experience in Phenolics, Vinyls, Styrenes and Nylons. Responsible for inspection and production. Will consider man with injection experience only. Northwestern Illinois location. Reply Box 573, Modern Plastics.

EXTRUDER ENGINEER—well established mid-western machinery manufacturer plans to build and market a line of plastic extruders. Needs man with experience and practical working knowledge of extruders and their applications. Job will consist of developing and improving existing designs company now owns with active sales application engineering after extruders designs are completed. Please submit complete resume for prompt and confidential consideration. Reply Box 511, Modern Plastics.

(Continued on page 222)

CLASSIFIED ADVERTISING

(*Continued from page 220*)

PLASTICS ENGINEER—Diversification of extruded thermoplastic products line by well-established company located New Jersey metropolitan area creates excellent opportunity for man having some experience with rigid vinyls. Primary responsibility will be research and development. Please submit complete resume for prompt and confidential consideration. Reply Box 501, Modern Plastics.

FOREMAN—to supervise manufacture of decorating masks for plastics, embossed metal and similar parts. General knowledge of light metal fabrication necessary. Age around forty. Salary open. Pittsburgh area. Reply Box 512, Modern Plastics.

PRODUCTION MAN—experienced in vinyl film and sheeting—excellent opportunity for aggressive person. Reply Box 505, Modern Plastics.

EXTRUSION ENGINEER. Experienced extrusion man, capable of handling projects through development and production of flat and tubular thermoplastic film. Knowledge of compounding, coloring, pelletizing, extrusion coating of paper and foil essential. Willing to locate in the middle east United States. Write, stating complete background, qualifications, salary, etc. All replies held in strict confidence. Reply Box 521, Modern Plastics.

SALES AGENTS WANTED: Leading manufacturer of plastics equipment invites letters from technical selling organization or individuals who are now acting as manufacturers representatives. Prefer those who have background experience in sheet or film material. Exclusive franchises are open in certain areas for new, highly specialized machines that are already in wide demand. Write, stating territory covered and types of present accounts. Your data is confidential with us. Reply Box 508, Modern Plastics.

POLYMER CHEMIST

Wanted, for process research in polymer chemistry, a young man with imagination, creative ability, ambition, and potentiality for advancement in the organization.

An attractive opening in our well-staffed and adequately-equipped research laboratory must be filled by a B.S., M.S., or Ph.D. Chemist or Chemical Engineer having at least two years' experience in developing processes for polymers by suspension or emulsion techniques.

If you would like to be considered for a personal interview, please submit, in writing, a resume of your qualifications, experience, and salary requirements to—

Director of Research and Development
MONSANTO CHEMICAL CO.
Boston 49, Massachusetts

PLASTIC MOLD DESIGNER WANTED—familiar with all phases of injection molding, capable of engineering and designing products and molds, estimating production and mold cost for a large manufacturing company. When replying, please state all qualifications, stating age, experience and education. Reply Box 535, Modern Plastics.

EMULSION POLYMER CHEMIST: Interest aptitude in colloid chemistry and experience in emulsion polymers. New opening in expanding development laboratory in Chicago. Give details of experience, and salary expected. Reply Box 504, Modern Plastics.

VINYL CHEMIST

Experienced production heavy and/or thin gauge calendered vinyls. Technical supervision production and quality control. Real opportunity for professional development. Pennsylvania location. Replies confidential. Reply Box 503, Modern Plastics.

EXPERIENCED PLANT SUPERINTENDENT for fast growing Southern modern injection molding plant. One who is experienced in production procedures as well as compounding of plastic materials preferred. Write full past experience. Reply Box 525, Modern Plastics.

CUSTOM MOLDING REPRESENTATIVE—Custom molding injection company requires representative in the eastern states on a commission basis. Have excellent assembly facilities which include all types of finishing, painting and spraying. Reply Box 541, Modern Plastics.

SITUATIONS WANTED

EXTRUSION: Thorough knowledge of vinyl powder blending, coloring and extrusion for profile sections, pipe and film. Estimating, production, development, sales and administration. Previous background of compression, injection and low pressure molding. Fifteen years experience in the plastics industry in engineering and administration. Desire position in administration or technical sales service. Reply Box 518, Modern Plastics.

PLASTICS ENGINEER—Five years experience in polyester, amine resins and molding compounds. Well-versed in product development, production supervision, quality control, plant design of thermosetting molding compounds. Registered Professional Engineer with degree in Chemical Engineering. Desire to locate in Mid.-West. Am 30, married, ambitious. I desire permanent position where my experience can be used. Reply Box 516, Modern Plastics.

SALES MANAGER—Plastic pipe, custom moulded and extruded. Presently handling national distribution—sales and advertising program—sales organization. Readily adaptable to progressive manufacturer, diversified to include polyethylene, tenite, styrene and vinyl pipe. Also custom extruded and molded with minimum capacity of $400,000 monthly. Have excellent management record. Remuneration basis immaterial. Reply Box 502, Modern Plastics.

PLASTIC PIPE AND PRESSURE VESSEL ENGINEER. Proved administrative ability and wide experience in oriented fiberglass structures with polyester and epoxy resins. Past employment in management field. Present work includes design and testing of 5000 psi pressure vessels and 6" plastic pipe for internal pressure 2000 psi. Interested only in position as plant manager or department head at $10,000 to $12,000. Reply Box 533, Modern Plastics.

PLASTIC EXTRUSION ENGINEER—12 years experience in all phases of extrusion, capable of assuming full charge. Well versed in die design, machine operation, estimating, quality control, production and plant management. Have been in executive capacities for nine years. Desire position with progressive concern in production or development. Age 35, married, will relocate. Reply Box 520, Modern Plastics.

YOUNG MAN, 30 years of age, college graduate, business administration training, 5 years selling experience, veteran, seeks connection with progressive concern in plastics field. Preferably Metropolitan New York or Long Island area. Willing to start at nominal salary as advancement and training is primary factor. Reply Box 519, Modern Plastics.

PLASTICS CHEMIST—37—can set-up and direct all phases of manufacture of thermoplastic molding powders, from scrap or flake, in extruders, mills, or Banbury. Have eleven years experience with large eastern scrap corporation where I initiated and directed testing, separation, color matching, and quality control. I prefer a profit-sharing arrangement. Reply Box 522, Modern Plastics.

INVESTIGATE—If you are interested in an experienced SALES EXECUTIVE. Organasols, Plastisols, Slush Moldings, Vinyl Solutions, adhesives, etc. Willing to travel anywhere. Age 40, college education chemical engineering. Must be permanent. Reply Box 510, Modern Plastics.

DETROIT MANUFACTURER'S AGENT—Desires line of formed Plastics, injection and compression types. Has valuable automotive and other Industrial Contacts, established over 15 years. Exclusive Territory commission basis. Reply Box 532, Modern Plastics.

ALERT YOUNG MAN, solid (4A agency) background all phases advertising, heavy direct mail; correspondence, direct selling. Headed for career advertising until lure plastics field interfered. In advertising developed plastic packaging ideas; familiar extrusion, injection, vacuum drawing. Wants location progressive plastics company in sales promotion or advertising. Reply Box 537, Modern Plastics.

EXTRUSION PLANT MANAGER: 14 years experience plastic diversified, development, general machine shop practice, design colors converting, purchasing, costing, personals, etc. Wishes related position with reliable concern and compensated salary. Reply Box 536, Modern Plastics.

MISCELLANEOUS

ORGANIC CHEMISTRY LABORATORY for sale, used for teaching students as Industrial Plastics Technicians, fully equipped, must be seen to be appreciated, with 1 oz. injection machine (manual) ¼" Extruder and compression Press. (40,000 lbs. pressure). Call DExter 1-6242 or write: NEW ENGLAND TECHNICAL INSTITUTE, 486 Broad Street, Providence 7, Rhode Island.

WANTED: PLASTICS MANUFACTURER FOR NEW, NON-COMPETITIVE bathroom item (Pat. Pend.) by nationally known inventor having more than 30 million of his devices in use. To be sold through a 5 & 10¢, drug, grocery chains and all independents. Jobber contact good, but not essential. Potential market several million a year. Royalty basis. Molder must assume cost of die approx. 7" by 5". Reply Box 526, Modern Plastics.

SELLING TO EUROPE. Because Britain and most European countries are short of dollars they cannot buy your products today, but we are building a new factory in England for the production of Electrical Insulation and will have space available to manufacture or process additional and preferably allied lines on a royalty basis. In addition to manufacturing capacity we possess a first-class marketing organization and capital for developments. Proposals will be welcomed. Reply Box 542, Modern Plastics.

FINANCIAL INTEREST—General Manager arrangement desired by Executive-Engineer with 10 year record of accomplishment in all phases of Proprietary Custom molding. Excellent creative background Product Design and Development, Sales, Injection Mold Design, Assembly and Finishing Methods, Cost Control, Incentive systems, etc. Medium sized plant preferred. Reply Box 531, Modern Plastics.

DISTRIBUTING COMPANY—Now covering aircraft and industrial plants in Missouri, Kansas, Oklahoma and Texas, wishes to specialize in plastics and reinforcing materials for sales to fabricators and larger firms with fabricating departments. Through close personal contact we enjoy a volume trade at all major plants in this area. Recommendations and financial references can be furnished. Reply Box 545, Modern Plastics.

BRITISH PLASTICS MOULDING Firm wishes to contact firm in United States with a view to exchanging technical information. Reply Box 514, Modern Plastics.

LARGE CANADIAN PREMIUM HOUSE desires contact with American injection molders who can offer injection molded premiums. Reply Box 540, Modern Plastics.

FOR SALE: Used Electroformed Copper Slush Molds. Poinsettia, Inc., Pitman 7, N. J.

All classified advertisements payable in advance of publication
Closing date: 28th of 2nd preceding month; e.g., April 28 for June issue.

Up to 60 words $10.00	Up to 120 words $20.00	Up to 180 words $30.00
Up to 60 words (boxed) $20.00	Up to 120 words (boxed) $40.00	Up to 180 words (boxed) $60.00

For further information address Classified Advertising Department,
Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.

HERE'S HELP

for your engineer-recruitment problem

Engineers' Joint Council and The Advertising Council offer free, expert help to advertisers promoting engineering as a career.

The booklet reproduced here was prepared by The Advertising Council in cooperation with the Engineers' Joint Council to help you make your advertising work most effectively in recruiting engineers for the future.

1. It tells you what the problem is and the important part you can play in solving it.
2. It outlines the advantages of an engineering career to help your company develop advertising appeals.
3. It informs you as to the current activities of industry in the education and recruitment of engineers.
4. It offers specific suggestions as to what you can do (from present manpower).
5. It provides material that you can use in your own local and national programs.

Many advertisers are using this booklet today. They say that it helps in orienting their engineer-recruitment advertising to industry-wide recruitment programs.

Send for this Free campaign guide
Prepared by
THE ADVERTISING COUNCIL
for the
ENGINEERS' JOINT COUNCIL

JUST MAIL THIS COUPON!

The Advertising Council, Inc.
25 West 45 Street
New York 36, New York

Gentlemen: Please send me a *free* copy of *"How your company can help promote engineering as a career."*

NAME: .....

POSITION OR TITLE: .....

COMPANY: .....

ADDRESS: .....

INDEX OF ADVERTISERS

MAY 1953

MODERN PLASTICS

575 MADISON AVENUE • NEW YORK 22, N.Y.

You saw this ad in Tool Engineer, Machinery, Modern Machine Shop, American Machinist Iron Age

and at CRUCIBLE MOLD STEEL *is* TOOL STEEL

Take our experience as tool steel leaders for more than 50 years — add it to the unique staff of mold steel specialists we maintain — and the result is *better* mold steel!

That's why Crucible mold steels are consistently chosen for most exacting molds. And why mold steel users are checking our strategically located warehouses for stocks to meet their needs.

Give us a call.

WRITE TODAY FOR YOUR TOOL STEEL SELECTOR

Get your copy of the unique Crucible Tool Steel Selector — a quick twist of the dial gives you the right tool steel for the right job. And it will help you select mold steel! Selector has 9-inch diameter; printed in 3-colors.

CRUCIBLE first name in special purpose steels

53 years of Fine steelmaking **MOLD STEEL**

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

at home ANYWHERE...

...TV Cabinets of PHENOLIC PLASTICS

The good taste that marks these television cabinets fits them for any room setting. Simple and functional, they blend handsome lines, clean finish and rich color into an eye-appealing effect.

They're proof of the many design advantages of BAKELITE Phenolic Plastics. Plastic molding has made sharp angles and corners unnecessary – soft, curving lines have been used without extra cost. The colors – ebony, mahogany, or walnut, are self-contained. The surface is harder, more scratch-resistant than applied finishes. Moist glasses won't mar it.

This practical beauty is important because table model TV sets are often moved about – from living room to porch to den – even by car to the summer cabin. And a cabinet molded in one piece from BAKELITE Phenolic Plastics stands up under such treatment.

Phenolic plastic cabinets retain their dimensions. They resist humidity and temperature change. The well-known electrical insulating properties of BAKELITE Phenolic Plastics are of major importance to the primary job – housing high-voltage electrical equipment.

Similar large-scale moldings of BAKELITE Phenolic Plastics include furniture drawers and cabinets for air-conditioning units. Large or small, your product designs can profit from the use of these materials. Bakelite Company engineers are ready to help. Write Dept. PY-13.

Motorola Television Cabinets molded by Chicago Molded Products Corp., Chicago, Ill.

BAKELITE
TRADE-MARK
PHENOLIC PLASTICS

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.
In Canada:
Bakelite Company (Canada) Ltd., Belleville, Ontario

GOLF BALL CONTAINER of BAKELITE Styrene Plastic is combination display package with bottom half usable as practice putting hole, and cover that becomes utility shelf when attached to locker. Molded by Cowan-Boyden Corp., Providence, R. I.

LUGGAGE HANDLES AND BINDINGS molded of VINYLITE Elastomeric Plastics are flexible, strong, tough. Resist water, perspiration, oil. Stitched binding is wrinkle-free at corners. Used on "Samsonite" case by Shwayder Bros., Denver, Colo.

DOOR SHELVES for Servel "Automatic Ice-Maker" refrigerator are made of BAKELITE C-11 Plastic, which provides strength, toughness, sharp detail, ease of cleaning, and resistance to food acids, oil, temperature extremes. Molded by Kusan, Inc., Nashville, Tenn.

63% SAVINGS

—through G-E molded nylon parts

The unique properties of molded nylon offer many advantages to users of plastics parts—also can make possible substantial cost reductions. For example, by molding a one-piece nylon gear and pinion to replace a steel pinion and laminated gear, General Electric realized parts cost savings of 63% for a fan manufacturer!

The unusual properties of nylon result in unusual molding characteristics and call for highly specialized molding techniques. Nylon, compared to most thermoplastic materials, has high shrinkage and a very fluid flow. High-quality tools and a considerable background on molded tolerances of this material are required for high-quality molded parts.

One of the world's largest and most experienced plastics molders, General Electric has the know-how required to help you take full advantage of nylon for the parts you need.

Write today for a free copy of "G-E Molded Nylon Parts" to General Electric Company, Section 340-5A, Chemical Division, Pittsfield, Massachusetts.

G.E.'s COMPLETE MOLDING SERVICE OFFERS YOU —

- Complete mold-making facilities
- Impartial material selection
- Injection presses from 3 to 208 ozs.
- Compression presses from 3 to 36 ins.
- Complete silicone rubber fabricating facilities
- Complete molded mycalex facilities

PLUS the benefit of 61 years' experience in designing, engineering and molding plastics parts.

You can put your confidence in—

GENERAL ELECTRIC